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A case study of distance education and its application to the Marine Corps Institute (MCI)

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A CASE STUDY OF DISTANCE EDUCATION AND ITS APPLICATION TO THE MARINE CORPS INSTITUTE (MCI)

by

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September, 1995

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To resolve problems identified in administrative operations, this thesis recommends the development of a relational database. Computer-based instruction and hypermedia courses were identified as appropriate technologies for use by MCI's distance education program. An implementation strategy that incorporates these technologies, utilizing existing telecommunications infrastructure, was developed.

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A CASE STUDY OF DISTANCE EDUCATION AND ITS APPLICATION TO THE MARINE CORPS INSTITUTE (MCI)

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ABSTRACT

The Marine Corps Institute (MCI) is the agency responsible for the administration of the Marine Corps' Correspondence Course Program. This thesis examines and analyzes the operation of MCI's correspondence program, then identifies areas that threaten MCI's ability to accomplish its mission objectives. This thesis also investigates the feasibility of using Information Technology (IT) to enhance the performance of MCI's current operations.

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I. INTRODUCTION

The Marine Corps Institute (MCI) is the Marine Corps' distance education agency in charge of providing military correspondence courses for Marines and other service members worldwide, both active duty and reserve. Its correspondence course program uses proven traditional methods of distance education that have been in place since 1920. For the last seventy-five years, every challenge to the organization's ability to perform has been met in typical Marine Corps fashion: "adapted, improvised and overcome." No obstacle was allowed to prevent MCI from achieving its mission objective: "to provide nonresident training and professional military education to Marines and other military personnel, active duty and reserve."

If the Marine Corps' distance education program has been accomplishing its mission, then why study MCI's correspondence program? The answer is that advances in computers and telecommunications have resulted in promising technologies with the potential to improve current distance education applications. These technologies are capable of decreasing time to proficiency, reducing cost, and improving retention. With this in mind, it becomes worthwhile to identify the areas that degrade the quality of course work and that challenge efficient and productive performance. It becomes crucial to explore new techniques of presenting educational and training information to students.

The current distance education program at MCI could benefit greatly from affordable and effective distance education methods that incorporate computers and telecommunications

technologies. This thesis provides a thorough analysis of the current MCI process for providing correspondence courses, a case study of distance education, and an exploration of advances in education and media technologies. The thesis then provides recommendations for improving MCI's information technology.

Chapter II describes MCI's correspondence course program. It includes a discussion of MCI's history and organizational mission. In addition, it includes a description of MCI's organizational structure, departmental functions, and its processes for student enrollment, course completion, and monitoring of course completion. The chapter concludes with an analysis of MCI's problematic areas. Chapter III, a broad overview of the distance education field, also includes a discussion of the various advanced education and training technologies.

In chapter IV, MCI's unique methods for individual instruction are described. The chapter also addresses the characteristics of the typical MCI student and gives examples of distance education programs that incorporate advances in information technology. Chapter V identifies appropriate improvements to the current MCI program and recommends plans for using the proposed advanced technologies. The thesis concludes with Chapter VI.

II. MARINE CORPS INSTITUTE CORRESPONDENCE COURSE PROGRAM

A. HISTORY AND MISSION

The Marine Corps Institute (MCI) was established as a resident school for enlisted Marines seventy-five years ago in Quantico, Virginia. Its initial mission was to boost post-WWI enlisted Marines' morale by providing them with an opportunity to voluntarily acquire an education. Using curriculum and materials from the International Correspondence Schools (ICS) of Scranton, Pennsylvania, Marine instructors educated students in automobile mechanics, music, typewriting and shorthand. Students attended the school on their off-hours on a part-time, in-residence basis. As in all military duty assignments, the Marines at MCI were subject to station rotation as they completed customary time on station. Thus, a much-touted advantage of the ICS correspondence materials was that when the Marines transferred and or were deployed aboard ship, they could take their courses with them.

Since those humble beginnings, the Institute has changed in many ways. MCI is now located in Washington D.C. Its original mission has grown and evolved to best serve the current needs of the Marine Corps. Of specific interest to this research is the significant change in the goal of MCI's Correspondence Course Program. Instead of providing courses that facilitate a successful transition from military to civilian service, all courses are now specifically designed for direct military application. This new focus is captured in the overall mission of the correspondence course program, which is: "to provide nonresident training

and professional military education to Marines and other military personnel, active duty and reserve."

B. MCI ORGANIZATION AND DEPARTMENTAL FUNCTIONS

MCI's hierarchical organizational structure consists of a small senior command element and six functional departments. The description of MCI's organizational structure included in this paper has been developed from a series of interviews with MCI staff members and information taken from a document published by MCI entitled "MCI Command Brief". This organizational structure is depicted in Figure 2.1. A director exercises overall authority and responsibility for the conduct of the Institute's operations and its members. He is assisted by a Deputy Director of Education and Operations, and a Deputy Director responsible for personnel.

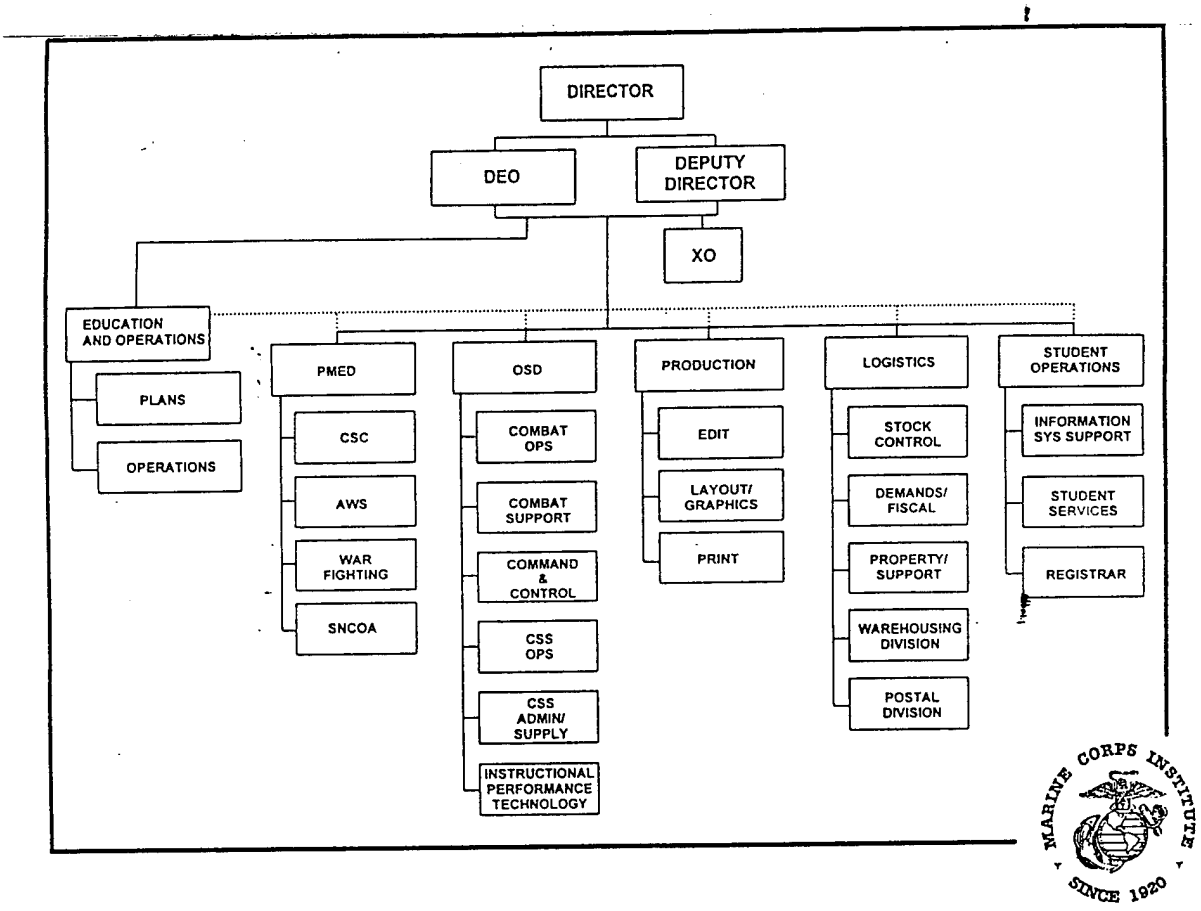

Figure 2.1 MCI Organizational Structure (MCI Command Brief, 1995)

The organization's six functional departments are:

- Education and Operations
- Professional Military Education Courses
- Occupational Specialty Courses
- Production
- Logistics
- Student Operations

Manned by military and civilian personnel, these departments are responsible for the development, production, logistic support and distribution of all correspondence courses, as well as for the management of student enrollment and course completion operations. In order to accomplish these tasks, each department carries out its own specific functions and missions. (MCI Command Brief, 1995)

1. Education and Operations Department

The Education and Operations Department exercises staff cognizance, specifically over the departments responsible for production and support of distance training and education materials. Through development of strategic plans, policy guidance and total quality management, the Education and Operations Department oversees the achievement of the organization's goals and objectives. The division is responsible for:

- Developing short, mid-term and long-range planning strategies
- Managing the intra-department and inter-department managerial process
- Prioritizing projects to ensure cost-effectiveness and efficient application of manpower resources and fiscal assets.

Their external responsibilities include advising the Marine Corps and interservice agencies on strategic planning regarding distance training, and officially representing MCI's planning and capabilities to Headquarters Marine Corps and the Marine Corps Combat Development Center (the Marine Corps organization responsible for all Marine Corps training and education programs). (MCI Command Brief, 1995)

2. Occupational Specialty Department

The Occupational Specialty Department's (OSD) mission is to plan, develop, and administer distance training to increase the specialized occupational skills and proficiency of Marines. The courses and supporting materials developed and implemented by OSD generally train students to accomplish a specific job or task using step-by-step instruction. Training objectives are achieved through individual occupational specialty correspondence courses and training manuals such as the *Marines Battle Skills Training Handbook* and the *Individual Training Standards System.* Training materials often include detailed pictures and text to make the purpose, methods and execution of tasks well understood.

Currently, there are 188 military occupational specialty-enhancing courses. Individual courses and the personnel who develop them are organized into the following divisions:

- DIV 1 Communications, Intelligence, Aviation (33 Courses)
- DIV 2 Infantry, Nuclear Biological Chemical, combat Engineers (39 Courses)
- DIV 3 Artillery, Tanks, Utilities, Amtracs, Engineer Equipment (45 Courses)
- DIV 4 Motor transport, Food Service, Ordnance, Logistics Embarkation, Maritime Repositioning Shipping (35 Courses)
- DIV 5 Administration, Legal, Supply, Fiscal (29 Courses)
- DIV 6 Job Aids Development (9 Courses)

While enlisted service members make up the majority of course enrollment, officers wishing to improve their knowledge of specific tasks sometimes take occupational specialty courses. (MCI Command Brief, 1995)

3. Professional Military Education Department

The mission of the Professional Military Education (PME) Department is to provide distance education to students as a prerequisite for entering a resident school, or, in some instances, to provide distance education in lieu of a residence course.

Its courses differ from those of the occupational specialty in that PME strives to "educate" rather than "train." Step-by-step instruction is replaced with essential information that, once comprehended, allows students to make better leadership and tactical decisions.

The various PME courses available are:

- Sergeants' Nonresident Program

  7001 - Techniques of Military Instruction

  7002 - Leadership

  7003- Drill and Ceremonies, Uniforms and Inspections, Customs and Courtesies

  7004 - Physical Training Management

  7005 - Weapons

  7006 - Battle Skills

  7007 - Administrative Plans, Policies, Procedures and Programs

  - Professional Readings

- Staff Noncommissioned Officers' (SNCO) Career Nonresident Program

  7103 - Tactical Communications

  7104 - Personal Administration

  7105 - Military Justice

7106 - Leadership

7107 - Military Training

7108 - Drill, Ceremonies, Uniforms Regulations and Inspections

7109 - Marine Corps History and Traditions

7110 - Operations

- Staff Noncommissioned Officers' (SNCO) Advance Nonresident Program

7201 - Physical Training Management

7202 - Drill, Ceremonies, Inspections &Awards

7203 - Military Justice

7204 - Professional Communications

7205 - Administration

Warfighting Skills Program

7401 - Tactical Fundamentals

7402 - Small Unit Tactical Problems

7403 - Combat Techniques

7404 - Marine Corps Leadership

7405 - Combined Arms

- Amphibious Warfighting School Nonresident Program (AWSNP)
- Command & Staff College Nonresident Program (CSCNP)

SNCO courses are generally taken only by SNCO, while AWSNP is taken by company grade officers (O-1 to O-3) and CSCNP by field grade officers (O-4 to O-6). (MCI Command Brief, 1995)

4. Productions Department

The mission of the Production Department is to provide technical editing and graphics support for the functional departments. By editing courses for accuracy of technical terms, grammar, punctuation, syntax consistency, and standardization, the Production Department ensures that all manuscripts are prepared for publication according to MCI quality standards. Their artistic functions include creating new technical illustrations and page layouts, as well as updating old graphics. (MCI Command Brief, 1995)

5. Student Operations Department

Student Operations' mission is to support the enrollment, grading and management of the MCI's distance education and training programs. This mission can be categorized into three main functions: registrar, student services and information systems.

As registrar, Student Operations conducts the following tasks:

- processing student correspondence
- preparing diplomas
- researching and preparing all transcripts
- maintaining microfiche records
- publishing MCI procedures manual
- manning help desk/providing immediate assistance
- coordinating resolving all course administrative issues

The tasks performed by student services are highly manpower-intensive. The time required to complete these tasks depends on the speed of reception of student information

from field units, the number of personnel available to work at the task, and the proficiency of the workers. The tasks include:

- processing individual and bulk enrollment
- auditing error listing from unit diary (means of error reconciliation with student parent organization)
- opscan/hand graded exams
- maintaining grading templates/failed exam file
- processing opscan error listing
- mailing out /processing /auditing Unit Activity Reports (UAR)

Information systems personnel and other resources provide support for all of MCI's information technology. Information systems personnel are responsible for the design, installation, operation and maintenance of all unit computer systems. The information systems personnel specific tasks include:

- providing production processing for the Marine Corps Institute Automated Information System (MCIAIS)
- providing local programming analysis support
- providing help desk services/micro computer support
- providing computer training
- LAN/WAN manager for MCI Network
- information systems management/planning for MCI

(MCI Command Brief, 1995)

6. Logistic Department

The primary mission of the Logistic Department is to procure, stock, package and distribute courses and training products for MCI. Its tasks include providing postal support for the distribution of course materials, maintaining organizational supply and logistics support, and managing MCI's allotted funds. The Logistics Department functions are distributed over six divisions: Stock Control, Fiscal Demands, Property Control/Support, Print, Postal and Warehouse.

Stock Control Division's (SCD)main functions are procurement and distribution. SCD is responsible for procuring and maintaining sufficient copies of course books, exam sheets and other educational products in support of the correspondence course program. In coordination with Student Operations, SCD oversees the packaging and distribution of these materials. Inventory control data developed and maintained by the department is used to monitor stock and initiate replenishment. SCD maintains an inventory of 1400 different items and conducts an average of 2200 replenishments per year.

The Fiscal Division holds MCI's purse strings. In 1995, that purse held 4.8 million dollars. The division, with input from other departments and divisions, develops the organizational budget and performs the organizations' financial accounting activities. Fiscal Division is also responsible for the financial approval of contracts used in conducting open market procurement, commercial training, and temporary additional duty travel. In 1994, Fiscal Division received 800 requests for service.

Accountability for organizational property and responsibility for general organizational administrative activities is provided by the Property and Support Division

(PSD). PSD maintains property accounting and custody records, develop and manage annual maintenance contracts, and manage facilities' parking, phone system and hazardous material activities.

The Print Division is, by far, one of the most active areas within MCI. In 1994, Print Division averaged 4 million reproduced units. The division's tasks include pagination and reproduction of correspondence courses and execution of blueline and post-printing approval for in-house work. The Print Division is also responsible for providing technical specifications for work commercially printed.

The Postal Division, like printing, is a highly manpower-intensive function. Postal Division job is to collect, package and present to the U.S. mail system all correspondence courses and other educational products distributed to individual Marine and units worldwide. Predominately military personnel work in five- to six-person teams to collect and package the materials. Civilian and military certified postal clerks perform the tasks of mail metering. Postal Division averages 2.2 million pieces of mail per year, at a cost of approximately $838,000. Other division personnel are responsible for management of cost accounting for all postal expenditures.

The Warehouse Division stores the stocks of correspondence courses awaiting distribution by the postal division. Much of their work consists of inventory control of all course and educational materials on-hand, as well as movement of that material from storage warehouses to the area where it is packaged for mailing. Warehouse Division average 1.2 million issues of material in this manner per year. (MCI Command Brief, 1995)

C. STUDENT ENROLLMENT PROCESS

1. Current Enrollment Options

The enrollment process begins with a conversation between a prospective student and the designated Unit MCI Clerk. After reviewing the contents of a course listing (provided semi-annually by MCI), the Marine tells the Unit MCI Clerk his or her choice of courses. The clerk then has two alternate methods by which he or she may notify MCI of the Marine's choices : 1) Send a pre-printed postage card referred to as an R-1 card to MCI via mail (see appendix A) ; or 2) send e-mail to MCI's electronic bulletin board (designated a unit diary entry) account located on a mainframe computer in Kansas City. In order to foster an appreciation for the manpower intensive action required to execute these option, they are explained in further detail in the following paragraphs.

2. Current Enrollment Methods

a. Enrollment by Postage Card

Despite the recent addition of a capability to electronically enroll students, the R-1 card is the primary means of enrollment. In a study of 300,000 enrollments, fifty-one percent were done using the R-1 card. The information entered on the R-1 postage card consists of the potential students's name, social security number, reporting unit code, unit address, rank, military occupational specialty, military affiliation, and Commanding Officer's endorsement. Unit MCI Clerks receive their supply of R-1 cards from MCI, and as needed, complete the cards and mail them to MCI via parcel post (fourth class) mail. Upon receiving the R-1 card (three to five days is considered to be a reasonable delay for postal

delivery in the continental United States), MCI sends the unit notification of reception, and then begins it's enrollment processing. This process is explained further in the section on *MCI Enrollment Request Processing Procedures.*

As stated earlier, reserve Marines are also eligible for participation in the MCI program. They generally do not have electronic access to the unit diary system, and therefore use R-1 cards, or in some cases, phone enrollments directly to MCI.

b. Electronic Enrollment

Electronic enrollment is available for units with unit diary access. Marine Corps units worldwide are connected to the Marine Corps's Personnel and Pay Management System (part of the Joint Defense Finance and Accounting Service) in Kansas City, Missouri. The MCI electronic bulletin board resides on the unit diary system, and enables units to dial-up and make enrollment request entries. MCI down-loads enrollment request data from the bulletin board and locally prints hard copies. The clerks in student operations then transcribe the data to a local student database kept by MCI.

3. MCI Enrollment Request Processing Procedures

Upon receiving the enrollment requests, the first step in processing the information is to enter the data in the local student database. MCI's student database (flat file, non-relational in nature) serves as a historical record of students enrolled in the correspondence program. When MCI receives the request for enrollment from the unit MCI Clerk, it is processed by adding the new student's name, reporting unit code, social security number, and course number to the historical student database. Once this information is entered into the database, a hard copy is printed and sent to the Logistic Department's Stock Control

Division, where the requested course materials are pulled from storage and packaged for distribution.

If course materials are out-of-stock, Stock Control Division notifies Student Operations, who then notifies the requesting Unit MCI Clerk of the expected course availability date, via mailed correspondence. If the courses are available, then the Stock Control Division sends the packaged course materials to the Postal Division, which mails course materials to the requesting unit.

D. CORRESPONDENCE COURSE MANAGEMENT

1. MCI Course Completion Tracking

The key to MCI's Correspondence Course management program is a document called the Unit Activity Report (UAR). The purpose of the document is to serve as a tool to track student course completion progress. This document is created at MCI and contains information such as student name, course taken, and current course status (e.g., student completed, dropped, extended, transferred). Other administrative unit and personnel information is included as well (see appendix B). MCI determines student status as a result of the course lessons and exams it receives (via mail) from an enrolled student. Once MCI generates the UAR, three copies are mailed to the Unit MCI Clerk for reconciliation. The Unit MCI Clerks confirms local student status, via the R-5 card (see appendix C), and annotates corrections as necessary. The report is then mailed back to MCI.

2. Unit Course Completion Tracking

In order to track the progress of individual student and unit participation, MCI provides a tool which is used to manually record student and unit actions. The tracking of individual progress is accomplished through the use of a Student Data Card for MCI Course (also called an R-5 card). Dates of individual enrollment, lesson and course completion status are annotated by the Unit MCI Clerk in the spaces provided on the card (see appendix C). As a student is transferred from one station to another, this card remains with his or her training records until the course of instruction is completed.

3. MCI's Automated Information System

MCI 's Automated Information System (AIS) is considered to be its management information system because of its management report generating capability, and the student database which resides on the system. The "system" is a Hewlett Packard 3000, model 937, minicomputer, and besides the UAR, the minicomputer runs over 100 other applications. Those applications include the historical student database, a telecommunications application connecting MCI to the Unit Diary, a network security program and many management information reports such as stock inventory lists and print order logs. The 100 plus applications that exist on the workstation are the aggregate product of years of individual department and division service requirement requests. Some applications still have relevance, and are used, some are not used. As a whole, the system's applications were not designed to operate as a integrated system and do not perform as one.

Though the workstation and its applications are called the Automated Information System, its ability to perform as a system is negotiable. All of the databases on the AIS are

flat file no-relational databases, where no information may be automatically exchanged between the files. Each program on the workstation is an independent entity and is not capable of drawing upon data within other programs, with the exception of the operating system, and the security program.

E. BASIC MCI CORRESPONDENCE COURSE METHODOLOGY

When a student receives course material from MCI, he/she may immediately begin their course of study. Each course consists of a series of lessons that require as little as five hours of total study, or as many as thirty study hours. Each lesson is concluded by an exam on the objectives of the lesson. Standardized exam sheets are provided for this purpose (see appendix D).

Completed exams are mailed to MCI, where the exams are graded. The thousands of exam sheets sent to MCI are graded either by a single electronic standardized test grading machine or by hand. Exam sheets that are rejected by MCI's electronic grading machine, normally due to some disfigurement of the sheet, must be graded by hand. Graded exams are recorded by MCI in the student's historical database, and scores are printed out and mailed to the student. The exchange of student exam sheets and test scores among the unit MCI clerk, MCI, and, finally, the student is currently conducted by mail in order to maintain the confidentiality of the scores.

If a student fails to score 80 percent or above on the lesson exam, he or she must retake the exam before proceeding to the next lesson. A new exam is mailed. After completing all of the course lessons, the student must take a comprehensive course exam.

The exam is cumulative in nature, composed of questions drawn from the entire course's lesson objectives. A score of 80 percent or higher on the final course exam is required to pass the course. (Ramos,1995)

F. CURRENT PROGRAM PROBLEMATIC AREAS

1. Changing Operational Environment

Using its present organizational structure, a resourceful and highly motivated staff, limited material resources, and adaptive operating procedures, MCI has been able to meet its mission objectives, despite the manifestation of some problematic areas. Effective January 1996, however, the Marine Corps will make enrollment in the MCI program a mandatory prerequisite (Presently, enrollment in the MCI correspondence program is voluntary.) to all enlisted and officer promotion and retention. It is very unlikely that MCI will continue to accomplish its mission without addressing its current problems.

Presently, there are no plans to make available more human and material resources to respond to what is sure to be a great administrative and logistical challenge. Indeed, MCI is likely to lose personnel due to the Armed Services' current reduction-in-forces trend. To meet the logistical challenges posed by the new mandatory enrollment policy, MCI has begun to investigate ways to improve both the efficiency of the organization's internal operations and the customers' perception of the service provided. But, before solutions can be developed, the current problem areas must be more clearly defined.

2. Potential Program Breakpoints

In the face of increased enrollment, two potential breakpoints for MCI's current correspondence program are: 1) management of student enrollment and course completion status, and 2) successful delivery of course materials by mass postal distributions. Since both operations are heavily manpower-intensive (Dionis, 1995), the organization's ability to achieve customer satisfaction is based on the size of the work force, not on the efficiency and quality of the personnel and processes used. Examining each of these areas more closely will show the potential for failure as a result of increased student enrollment.

a. Enrollment and Unit Activity Report Management

Accuracy and, therefore, effectiveness of MCI's student enrollment process and UAR are dependent upon the timely exchange of information between MCI and the Unit MCI Clerks. If Unit MCI clerks fail to mail enrollment requests, or electronically transmit enrollment requests and UARs, then enrollment and UAR records kept by MCI will be inaccurate. If Unit MCI Clerks' input (either mailed or electronically sent) for the UAR is not received by MCI five days before the end of the month, then at the end of the month, MCI sends that unit three copies of a monthly UAR that is unchanged from the last report. At this point, the document contains no more recent information than was published before, and mailing it to the unit was a waste of resources.

(1) Untimely Unit Submission

Why do Unit MCI Clerks fail to get the information to MCI in a timely manner? The performance of Unit MCI Clerks varies from command to command, and, at

present, there is no tool to accurately measure this performance. Clerks receive no formal training (even though procedures for processing information are not intuitive), and senior unit-level supervision of completed work varies. Often, the job of Unit MCI Clerk is not the primary duty of the individuals tasked to perform the job. Therefore, they must divide their time among several jobs. At times when other unit operational commitments are high, the performance of Unit MCI Clerks may worsen as they shift their emphasis to accommodate higher priorities. As a result of such conditions, the information exchange process between MCI and the Unit MCI Clerk breaks down.

(2) Repetitive Data Entry Requirements Increases Error Risks

After MCI receives student enrollment requests and UARs from Unit MCI Clerks, the rate at which MCI may enroll or update individual course completion status depends heavily on the available human resources. Presently, a crew of six administrative clerks works eight to ten hours a day, five days a week completing repetitive data entry. Their goal is to complete the total population of UARs (which is 1500 reports in number) by the fifth day prior to the end of the month. (Ramos, 1995) Sometimes this goal is achieved, and sometimes it is not. There are no statistical data available to indicate the number of successful efforts. Consequently, feedback on the performance of the clerks is attained by MCI through semi-annual site visits, mailed comments, and telephone interviews with unit representatives.

Again, the clerks at MCI may receive requests for student enrollment either electronically or in printed copy. For student course completion, the clerks will receive a printed copy of the UAR. After receipt of all student enrollment and course completion data,

the clerks must then manually transcribe the information over to MCI's own local database. Neither set of actions reflects what would be the most efficient--to have the user units load the information directly into a MCI database.

An increase in enrollment (January 1996 enrollment mandate) is sure to make such a manpower-intensive process fail. With only six clerks available, each one may be responsible for correcting hundreds of individual reports. Reports can range in length from several pages to many pages--in effect, hundreds of unit entries. Conducting this repetitious work, clerks become "burned out" over time; mistakes are made and productivity falls. Given this set of conditions, it is not surprising that, according to one person in the UAR 's section, in the period of a month, 300 of the 1500 UAR completed never made it to the their final destination.

In addition to the problems described above, MCI's electronic enrollment system experiences problems when enrollment data is downloaded by MCI from the Unit Diary System. As much as 20 to 25 percent of the data have been lost on occasion. It is believed to be an error in the telecommunications program. However, at this time, the exact cause of the problem is undetermined. What is known about the problem is that it has occurred repeatedly and, that as a consequence of the loss of data, customer satisfaction with MCI's response to custom inquires is low.

To avoid this problem, units both send in R-1 cards and enroll electronically, to ensure receipt of a course. The downside of this is that sometimes students are enrolled twice and receive a double set of class materials, a waste of time and resources.

Present student enrollment procedures and the efforts and resources expended in the creation of the UAR are inefficient uses of limited human and material resources. A substantial increase in course enrollment is sure to exacerbate an already unworkable situation. Any methodological or instrumentation improvement must address the problems presented in this section.

b. Process Measurement

Presently, MCI does not actively collect and process data concerning the reception times of individual UARs; nor does it compile data concerning the quantities of Unit Activity Reports they receive on a daily, weekly, or monthly basis. The term actively is used here to indicate conscious, planned use of information, as opposed to passive reception. The system captures the information--e.g., an electronically sent UAR's time of delivery is automatically logged by computer, or a clerk makes an entry in a log book when he or she receives a unit's printed UAR. But the date and time of delivery is currently not captured as part of an information management process; nor is it used to measure the process.

Formal statistical measures are not in place, nor is a person who is responsible to process such information.

c. Mail Delivery of Course Materials

The successful delivery of course materials by mass postal distribution has always been a problem for MCI. This method is extremely costly, ranging from $9,000 to $15,000 per week (GySgt Toushette, 1995), and is burdened with delays, both real and perceived. Tens of thousands of dollars (even at fourth class mail rates) are spent weekly to

send what amounts to volumes of texts to students worldwide. Sometimes these course packages are sent to a wrong location, either because students have transferred, and MCI was not notified, or because there is a mistake in the unit mailing address used. After a month, if the Unit MCI Clerk cannot account for the missing course materials, they are usually reordered. This creates an additional cost in both printing and postage.

Distribution delay (from MCI to the Unit MCI Clerk) when using the US Postal System is inherent to the mailed correspondence course process. In this case however, US postal personnel are not the only mail personnel involved in the mail delivery process. Delivery of course materials, even after materials arrive at the military installation postal system, involves several other mail processing and coordination steps. These steps serve as an additional source of delay in the final delivery of materials to students.

When MCI course materials arrive at a unit (via the US mail), they may need to be processed by several layers of military postal echelon--e.g., installation postal service, immediately subordinate unit postal service representative, receiving unit postal service representative. Courses are first received at the local area post office of the requesting unit, and then passed down a postal chain of custody (civilian to military) until the materials reach their final destination. New students receive course materials after they are processed from the local post office, down through the military post office chain, and, finally, to a level to which the unit MCI clerk requesting the courses has access. (Ramos,1995)

There are several problems associated with the pickup of mail beginning at the military mail facilities (also considered to be inherent). Sometimes units are not able to make mail pick- ups at the appropriate time due to tempo of operations, and sometimes the mail is not

available for pick-up at the appropriate time due to the abundance of product to be processed. Additionally, the amount of mail (personal and MCI course materials) delivered to the unit on a daily basis is also limited by the volume individuals may pick up.

The person responsible for individual unit mail pickup transports as much mail as they are able, given a limited time for their pickup and processing duties, and the space within their vehicle for transport. At the postal facilities, a unit postal clerk is serviced in queue with others also tasked with picking up unit mail. First priority goes to the delivery of personal mail, while MCI course materials assume a lower priority. When, as a result of mail volume, all available course materials are not picked up on the first attempt, a second attempt is made at the next scheduled pick up opportunity (usually the next day). As a result of these conditions, even though course materials have actually been delivered to local mail facilities, there still may be some delay in delivery to the lowest level.

Even after the mail is in the hands of the Unit MCI Clerk, further delays in notifying students of the arrival of their course materials occur. Once again, no descriptive statistical data has been collected which indicates the time it generally takes Unit MCI Clerks or students to receive course material, even though the materials have actually been delivered to the main military post office. Thus, there is a definite need for improvements to the correspondence course program distribution system, including the development of appropriate metrics to measure performance.

d. Student to Instruction Interaction: Timely Grading of Course Exams

The next problematic area to be examined is the logjam created in the grading of individual lesson and final course exams. Presently, two Marines at MCI share responsibility for operating the lone automatic standardized-test grading machine used in grading all MCI lessons and exams. This translates into literally thousands of exam sheets that have to go through the grading machine. The only exceptions are exam forms found unserviceable by the machine. These exams must then be graded by hand.

While as many as 6000 exams have been graded in one day, grading 4000 (both numbers were accomplished using the automatic grading machine) represents a more reasonable daily expectation (Ramos, 1995). When this sole machine fails, or when both trained equipment operators are indisposed, the entire grading process comes to a halt. If grading is delayed or brought to a standstill, then interaction between the student and the source of instruction will likely suffer a similar fate. Any system or process improvement should address this potential logjam.

G. OTHER PROGRAM IMPROVEMENT CONCERNS

MCI wants its courses to continue to reflect the latest and best of distance education teaching trends. In recent years, advances in computer processing power (at all levels--from mini to mainframe), telecommunication data transfer speeds, and computer memory storage capacities have inspired educators to develop new and innovative teaching methods using computers. To determine if these advancements can help MCI accomplish its mission

objectives, an examination of the methods deemed appropriate for the Marine Corps' Correspondence Program is necessary.

III. DISTANCE EDUCATION

A. INTRODUCTION

This chapter represents a broad overview of the field of distance education. The research is a general case study of distance education. It is intended to provide guidance for understanding the problematic areas, described in chapter two, and the eventual proposal for information technology improvements, detailed in Chapter V. The information is derived from an exhaustive literature review of the current methods and technologies used to deliver educational instruction to students who are geographically separated from the providing institution. Specific attention is paid to some of the current issues being considered in course design and adaptation of delivery systems by educators.

B. DEFINITION OF DISTANCE EDUCATION

The literature on distance education offers several definitions. A typical, and obvious, definition is: the separation of teacher and student in time and space (Holmberg, 1986). Though this definition is a good start, rapid progress in instructional technology and knowledge of a student's requirements in distance education programs demand a more elaborate definition.

Lauzon and Moore (1989) more thoroughly describe distance education as "the relationships of technology and media," with media encompassing four facets: communications channels (print, audio, visual), delivery systems (mail, communications networks, computers), method (group and/or individual), and delivery mode (synchronous

and/or asychronous). For the purpose of this research, distance education will be regarded with respect to several factors about the learning situation:

- The existence of a teacher/instructor, one or more students and a contract between the two stipulating the learning of subject matter.
- An environment that includes physical and time separation of teacher and student.
- Physical separation of the students and the institution that is sponsoring the learning situation.
- Any materials specifically designed to be used in distance study. (Wells, 1990)

Educational context, learner's attitude and maturity, degree and type of communication, and delivery medium are just a few factors that interact to form the learner's perception of separation (i.e., psychological separation) from the instructor. Perceived distance can more greatly influence the educational experience than does actual distance (Bramble, 1990, p. 105). In fact, the learner's perception of distance may have no relationship to actual distance. Distance education technologies involving real time interaction and video can help reduce perceived distance (Bramble, 1990, p. 105).

C. THE INSTITUTION'S GOALS

A range of opinions exist as to when distance education is applicable. At one end of the scale, a more restrictive opinion is that " distance education systems provide a standard, for credit courses covering the same material as their parallels on-campus, but doing it at a distance through some form of communication technology and media" (Bramble, 1990, p.

17). At the opposite end of the scale, opinions contain much broader applications and purposes for distance education, such as Bramble's description:

> Learners generally prefer direct, face-to-face instruction, when quality instruction exists at a time and place convenient to the learner. Distance education becomes a viable alternative when situations dictate that either the location or timing of the instruction is inconvenient to the learner. Distance education is utilized to its fullest potential when it has the ability to "improve access to instruction/training, provide access to subject matter experts and role models, provide interaction and joint activities with students at other locations, and increase access to information and instructional resources (Bramble, 1990, p. 103).

Six primary goals or motivations that may guide an educational institution to use distance education are described in a study preformed by Andre Delbecq and Debra Scates in 1989. The study was sponsored by the American Assembly of Collegiate Schools of Business (AACSB).

1. Participate In Joint Ventures

Educational institutions may desire to increase cooperative ventures among themselves and other schools and corporations. This permits students to see applications of the knowledge and skills they are learning and enables companies with geographically-dispersed operations to equalize educational access for their employees. (Delbecq and Scates, 1989, p. 2)

2. Provide Educational Access

Institutions may be motivated to provide educational access to students who are unable to participate in a residential program. This group may include full-time workers, rural people, the handicapped, the elderly, prisoners, military personnel, and business executives

with unpredictable schedules and frequent travel obligations. (Delbecq and Scates, 1989, p. 2)

3. Provide Individualized Learning

Accommodating an individual's particular learning style and time constraints is a powerful motivation for implementing a distance education program, according to Delbecq and Scates. Institutions may wish to utilize distance education techniques which help learners who prefer and perform better in an individualized learning mode. Goals pertaining to time may include accommodating the learner's daily schedule and offering learning at an opportune time in a student's career path. (Delbecq and Scates, 1989, p. 3)

4. Increase Throughput

Institutions can enlarge their markets by enrolling more students in degree and non-degree programs. This factor is a by-product of providing educational access. (Delbecq and Scates, 1989, p. 3)

5. Optimize Use of Existing Investments

Educational providers seeking optimal use of existing investments may be attracted to distance education. Many individual institutions with existing technology and communications may wish to incorporate them into a distance education program, ultimately reducing the cost of developing a system. (Delbecq and Scates, 1989, p. 2)

6. Equalize Access to Quality Education

Lastly, distance education can give students access to specialized faculty competencies at more than one educational institution. Equalizing access to quality education is achieved

by making it possible for the student to learn from outstanding researchers and educators at multiple institutions. Cooperative ventures between institutions distribute the cost of the knowledge resources. (Delbecq and Scates, 1989, pp. 2-3)

D. THE LEARNER

Distance learners are understood in terms of their personal traits; the control they possess over their own educational process; interactions with the course material, fellow learners, and instructors; and time constraints.

1. Personal Traits

Individual learners are characterized by personal traits which affect their degree of self-direction and control in the learning environment. These traits include, but are not limited to, intellectual ability, learning skills, attitude, emotional maturity, cognitive style, self-concept, motivational level," and personal values. Because individuals' personal traits are highly variable and are constantly subject to change, the educational process can be managed in ways that encourage positive development and application of the learners' personalities. Such approaches emphasize greater control of learners over their education. (Garrison and Baynton, 1989, p. 20)

2. Control

D. R. Garrison and Myra Baynton originated a conceptual model (Figure 3.1) in which

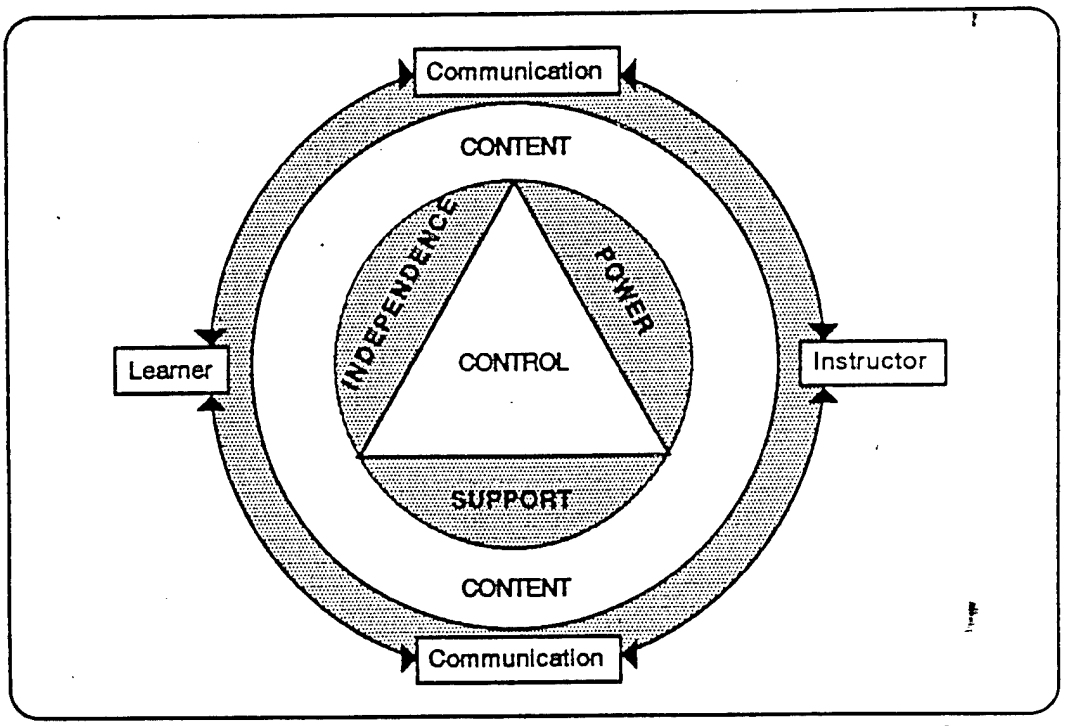

Figure 3.1 The Concept of Control (Garrison and Baynton, 1989,16)

student control of the learning process is determined by a balance of three dimensions: independence, power, and support (Garrison and Baynton, 1989, p. 16). *Control* is defined as :

> the opportunity and ability to influence, direct, and determine decisions related to the educational process . . . achieved only by striking a balance between independence, power and support in the learning process through the process of two-way communication between instructor and learner (Garrison and Baynton, 1989, p. 18).

Independence is generally characterized by "the degree of control learners exert over the context and method of their learning." The authors argue that, despite the attention given to the concept of independence, control and independence are not synonymous. The development of learner independence and self-direction has widely been held as a primary objective of distance education, but there has been little agreement about the meaning of independence. How much of it is desirable? How can independent behavior best be

cultivated in learners? The encouragement of independent behavior, if isolated from power and support, is not useful in distance education since it omits the critical variable of interaction with an instructor. (Garrison and Baynton, 1989, p. 17)

From an individual learner's perspective, independence is the freedom to determine one's own educational process, i.e., "the freedom to choose one's learning objectives, learning activities, and methods of evaluation" (Garrison and Baynton, 1989, p. 19). Independence assumes the availability of alternatives, learner awareness of the alternatives, and freedom to select from among the alternatives. The educational process which fails to incorporate an adequate degree of autonomy for its distance learner creates a highly directive relationship between instructor and the learner.

The element of *power* is introduced by trying to determine the legitimate question of whether learners are "capable of assuming the responsibility of choosing and reaching educational goals."

Power is:

> the ability or capacity to take part in or assume responsibility for the learning process. Without the requisite intellectual ability, study skills, or motivation to be involved independently in a learning process the individual cannot be in control of the learning situation. (Garrison and Baynton, 1989, p. 20)

Power reflects a learner's personal traits of cognitive style, emotional maturity, motivation, attitude, self-concept, and skills, all of which are necessary if the learner is to be successful and complete a program of learning. (Garrison and Baynton, 1989, p. 20)

Support consists of "the resources the learner can access in order to carry out the learning process." These resources include courses, teachers/facilitators, course materials,

experts, reference materials, media, financial assistance, emotional support, etc. The instructor's and facilitator's roles in providing or coordinating support is crucial for increasing learner control of the learning process. (Garrison and Baynton, 1989, p. 20)

Support is determined by the relationship between the teacher/facilitator and the learner. There are two types of supporter influence on learners: (1) assisting the student in making decisions by providing suggestions, advice, and information; and (2) managing, controlling, and directing the interaction. "The distinction between help and control is important, because it helps us realize that a learner can receive a great deal of help without giving up any of his control or responsibility." Real support enhances rather than diminishes learner control. (Garrison and Baynton, 1989, p. 21)

Support is "the structural dimension of control . . . primarily concerned with how programs are structured and delivered to the individual student." Learner control is increased by increased accessibility and availability of resources. The use of technology to mediate two-way communication between teacher/facilitator and learner has an effect on support in distance education. (Garrison and Baynton, 1989, p. 21)

Because control is a complex and dynamic process, the learner will exercise a varying degree of control based on individual needs and educational context. Therefore, control must be viewed as a relationship between all three elements in a balance. A false interpretation of control will result if any element is evaluated in isolation. Real control gives the learner "the freedom to explore possible learning objectives, the power to handle a learning activity, and the support necessary to complete the educational experience." (Garrison and Baynton, 1989, p. 18)

This delicate balance is maintained through communication between the teacher/facilitator and the learner. Garrison and Baynton write that "communication is the means for the integration and balance of the components in the educational transaction." Communication takes place in two forms. The first form, dialog, requires the availability of the instructor to answer specific questions and support the instructional process. The second form, planning, guides negotiation of program structure and development, including negotiation of content and learning objectives, establishment of learning activities, and determination of evaluation procedures. (Garrison and Baynton, 1989, p. 23)

Garrison and Baynton describe two communication variables dialog and structure which play a significant part in determining the effectiveness of the distance education process. As Garrison and Baynton point out:

> Dialog represents communication during the instructional transaction (learning phase) and is concerned with the student's intellectual, physical, and emotional needs for learning. Structure, conversely, is concerned with the preparation and flexibility of the program. It also appears to reflect the degree to which the teacher determines the objectives, content, and strategies. (Garrison and Baynton, 1989, p. 22)

It is important that instructor-learner negotiation of structure occur prior to the instruction. The degree of learner control is determined by the quality and form of instructor-learner communication. (Garrison and Baynton, 1989, p. 23)

The effects of communication in determining control are characterized by its purpose, how it is mediated, and who initiates it. The initiator has the advantage of controlling the educational process. Initiation has a direct effect in determining the balance among the three dimensions of control. (Garrison and Baynton, 1989, p. 24)

Frequency and immediacy are additional issues which determine communication's effect on control. Instructor-leaner contact may be very frequent, moderately frequent, or infrequent; scheduled or as needed; and instructor-determined, learner-determined, or determined by both. Immediacy reflects how promptly feedback is received. (Garrison and Baynton, 1989, p. 25)

A communication process characterized by a high frequency and immediacy has greater potential for control by the student than that characterized by low frequency and immediacy. The technologies selected to mediate distance education affect communication (interaction) between instructor and learner. (Garrison and Baynton, 1989, p. 25)

3. Learner Peers

Unless distance learners are participating in independent distance education, they will have learner peers, other students enrolled in the same course(s) at the same time, either at the same or at different locations. Interaction amongst peers may be an important aspect of the learning process (Andrews, 1989, p. 13).

4. Time Constraints

Time constraints include scheduling constraints arising from employment and spatial separation, as well as the critical timing of educational opportunities in the learner's career. Time constraints should be considered in designing a distance education program. (Delbecq and Scates, 1989, p. 2)

E. THE INSTRUCTOR

As previously mentioned, the distance instructor is the principal source of expertise and learner support, providing progress feedback, counseling, encouragement, and reality testing (Moore, 1989, pp. 101-102). More often than not, the instructor will also be the distance course designer (Delbecq and Scates, 1989). In order for distance instructors to be effective, they will need additional instruction in learning theory, media and materials, communications methods, questioning and feedback techniques, and group coordination/team building (Bramble, 1990, p. 62).

Two views exits as to the correct support roles of instructors /facilitators. One view maintains that support means treating students as potentially independent people to whom it is left not only to decide, but to state expressly, if and to what extent they want support and advice. This view promotes giving learners what they ask for. The opposing view gives learners what they are perceived to need. This view assumes that most adult learners are uncertain of what degree of support they need, which requires active intervention to prevent failure and encourage student success. (Garrison and Baynton, 1989, p. 20)

F. INTERACTION

Distance education potentially involves three types of interaction, or interactivity: (1) learner-content interaction; (2) learner-instructor interaction; and (3) learner-learner interaction. (Moore, 1989, pp. 100-03)

As Andrews points out, interactivity is necessary for education, including distance education:

> Learning requires interaction. The learner must accept the information provided, process it, and internalize it. Furthermore, the instructor requires feedback from the student to adjust instructional strategies, apply remediation, and respond with encouragement that is intrinsically motivating. Through various communication systems, students and instructor, and students and students can converse. Also, students interact with the instructional content: sometimes the instructor is a machine. The issue is to establish standards for interactivity, guidelines for achieving, and requisite skills for distance learning faculty with respect to interactivity. (Andrews, 1989, p. 11)

1. Learner-Content Interaction

Learner-content interaction is the fundamental process of intellectually interacting with content that results in changes in the learner's understanding or perspective, or the cognitive structures of the learner's mind. Without it there cannot be education. This process involves the learner's self-interaction, an internal conversation in which the learner delves into the ideas, concepts and information found in the content. (Moore, 1989, pp. 100-101)

2. Learner-Instructor Interaction

Learner-instructor interaction is the educational exchange between the learner and the expert who prepared the material. This type of interaction attempts to achieve common objectives held by most educators. These objectives include:

- Maintaining meaningful student involvement, to include

  (1) stimulation or maintenance of student interest in the content;

  (2) student motivation to learn; and

  (3) enhancement of student interest, self-motivation, and self-direction.

- Presenting the material, including information, skill demonstrations, and attitude and value modeling.

- Organizing learner application of the content, including organizing evaluations of learner applications.
- Providing counseling, encouragement, and support to learners. (Moore, 1989, pp. 101-102)

The lack of learner-instructor interaction causes the learner's application of the content to suffer. Without sufficient learner-instructor interaction, learners do not know enough about the subject to be sure that they are:

- Applying it correctly
- Applying it as intensively or extensively as possible or desirable
- Aware of all the potential areas of application. Interaction with an instructor is likely to be most valuable for reality testing and feedback (Moore, 1989, pp. 102-103)

As previously discussed, learner-instructor interaction has the potential of promoting greater learner control.

3. Learner-Learner Interaction

The interaction between learners is the final form of interaction. This interaction can be between two or more separate learners, between combinations of single learners and groups, or between two or more groups of learners with or without the immediate or mediated presence of an instructor or facilitator. In some cases, where concepts and skills dictate, learner-learner interaction proves to be the most effective and beneficial in the learning process. (Moore, 1989, p. 103)

Moore emphasizes that distance educators must structure programs to ensure the maximum effectiveness of each type of interaction, and to ensure that they provide the most suitable interaction for the various teaching tasks of different subject areas and for learners at different stages of development. (Moore, 1989, p. 104)

G. PRESENTATION

Presentation is the primary means by which instructors convey educational information to the learner. This includes, but is not limited to, presentation of information, skill demonstration, and attitude and value modeling. Communications media technologies mediate this interaction between learner and instructor. (Bramble, 1990, p. 30; Moore, 1989, p. 101-102)

H. CONTENT

The content of a course consists of the information, ideas, attitudes, values, and skills presented by the instructor, in learning materials, which are received and mastered by the learner (Bramble, 1990, p. 30; Moore, 1989, p. 100-101). Content is found in all forms of education (Moore, 1989, p. 101). The learner's interaction with content leads to learning and the eventual construction of knowledge (Andrews, 1989, p. 11-13; Moore, 1989, pp. 100-101; Novak and Gown, 1984, p. 7). As described earlier, learners' interaction with the instructor will increase the learner's application of the information. Garrison and Baynton propose that granting greater learner control over content is the eventual goal of distance education (Garrison and Baynton, 1989).

I. MEDIA TECHNOLOGY

Effective distance education requires a combination of technologies that are appropriate to instructional design and presentation methods of the educational program (Bramble, 1990, p. 105). Before describing media technology, it is important to differentiate between the two forms of technology. The first form, storage media technology, is any medium where information is maintained, such as audio/video tape and optical disk. The second form, transmission media technology, is any communication path that facilitates the distance educational interaction, such as telephone lines and satellite transmissions. Each form of technology has it appropriate application.

Bramble distinguishes between two groups of media technology. First, there are technologies that involve real time educational transmission; these decrease the distance perceived by the learner and instructor. Second are those technologies that the learner uses off-line and at their immediate learning site. These may be printed correspondence material, audio/video tape, and computer- aided instruction. (Bramble, 1990, p. 105)

1. Communication Through Communication Media

Keller theorizes three assumptions of communication which should help guide educators in planning, designing, selecting and developing distance education programs. First, media are the backbone of communication in their ability to bring the content to the learner. Second, media influence the effectiveness of the education process. Third, one or more of the senses must be stimulated by the transmission of the instructional material (Keller, 1989, p. 7). The fundamental characteristics of communication are media

(transmission and storage), delivery mode (text-based, audio, video, or computer-based), and direction (one-way or two-way).

Communication should attempt to enhance the dialog and structure in the educational process, as described earlier in this chapter. Dialog is "communication during the instructional transaction (learning phase) and is concerned with the student's intellectual, physical, and emotional needs for learning". Structure is "concerned with the flexibility of the program. It also appears to reflect the degree to which the teacher determines the objectives, content, and strategies" (Garrison and Baynton, 1989, p. 23).

2. Storage Media

Storage media in their most fundamental form provide a means for saving data. This data may be in the form of text, numbers, graphic images, sound resources, and executable computer instructions. This section will describe technical attributes of each medium and its potential applications to distance education.

a. Printed Medium

Printed medium (also called text) may contain textual information (words, numbers, and other symbolic communications) and visual information, such as photographs (exact likenesses of real objects) and graphics (illustrations, charts, graphs, etc.).

b. Magnetic Medium

Magnetic medium record data in patterns of alternating polarization or differential degrees of magnetization upon a magnetic surface (Gallant, 1982, p. 159). In order for magnetic media to be written to and read from devices which can physically

change and sense the magnetization of segments of the medium is required. Analog magnetic media, which record and read continuous levels of magnetization, include audio and video tapes. Digital magnetic media record discrete bits of data, units of positive or negative polarization that can be interpreted by computers as ones and zeros. These include standard computer floppy disks, fixed disks (hard disks), computer backup tape, and digital audio tape. Data stored on magnetic disk media are accessed directly, making magnetic disks suitable for interactive software programs. Data stored on tape is sequentially read, or accessed, making tape media unsuitable for interactive material. (Buddine and Young, 1987, pp. 6-12)

c. Optical Medium

Optical medium consist of information physically stored on disk in the form of pits, and the flat spaces between them, called land. The pits are burned into a plastic type surface by a laser beam and coated by a reflective metallic layer and a protective lacquer layer. The data is read from the disk using a focused laser beam shot through the protective surface. When the laser strikes land, it is reflected into a photo-detector, but when it strikes a pit, the laser light is scattered and absorbed. Optical storage media include L-ROM (long-view read-only memory) disks, 12-inch laser disks used primarily as a mass storage device for digital data and combinations of digital data with television imagery. Data storage ranges between 800 to 1,000 Megabytes of data per side of the disk. Presently, many different optical storage systems have developed as the result of no single standard. A second form of optical storage is CD-ROM (compact disk read-only memory) disks, 12 cm. disks which can store data in excess of 700 megabytes or 300,000 pages of text. Because CD-ROM disks

are an adaption of CD audio disks, their exists a current standard for their use. A one-time writable variant of the CD-ROM disk is the WORM (Write Once and Read Many) disk. (Hinton, 1991)

Because optical storage devices, CD-ROM disks in particular, can access data directly, they are ideal for interactive computer programs. Combined with their ability to store large volumes of data, this makes optical storage devices appropriate for the distribution of large volumes of text and other material typically distributed on paper or through on-line services. Massive storage capacity, direct access, and a relative lower cost also make optical media a good choice for electronically stored educational reference (i.e., library) materials.

3. Transmission Media

The physical path between transmitter and receiver in a data communication system is the transmission medium. Transmission media can be broken down into two categories: guided media, which contain twisted pair, coaxial cable, and optical cable, and unguided media, which include terrestrial microwave, satellite microwave, and radio. The nature of the signal and the medium determine the characteristics and the quality of the data transmission. In the case of guided media, the actual characteristics of the media (data rate, bandwidth, and space between repeaters) are more important in determining the characteristics and quality of the data transmission. In the case of unguided media, though, the frequency band produced by the antenna is the important characteristic. (Stalling, 1994, pp. 69-71)

(1) Twisted Pair

Twisted pair, as the name implies, is conducting lines which consist of two insulated copper wires bundled and sheathed with other twisted pairs. Each pair acts as an individual communication link. Twisting is done to minimize the distortion between adjacent wires. In both analog and digital transmission, it is the most prevalent transmission medium. Currently, it is the foundation of the telephone system and the backbone for intrabuilding communication. When compared with other transmission media, twisted pair is inferior in distance between amplifiers, bandwidth, and data rate. It also suffers from interference and noise. (Stalling, 1994, pp. 69-71)

(2) Coaxial Cable

Coaxial cable is a conducting medium consisting of two conductors surrounded by an insulating layer and an outer protective jacket. Coaxial cable is constructed to operate over a wider range of frequencies than is twisted pair. The most versatile transmission medium, coaxial cable is increasing in the number and variety of uses. Coaxial cable is capable of transmitting both analog and digital signals. Coaxial cable is superior to twisted pair because of its superior frequency characteristics, which allow it to be used more effectively at higher frequencies and data rates. Because of its construction, it is also less susceptible to interference and noise. Currently, coaxial cable is used for long-distance telephone and television transmission, television distribution, and local area networks. (Stalling, 1994, pp. 72-75)

(3) Optical Fiber

Optical fiber lines are conducting lines composed of glass fibers that carry information as light pulses. Cylindrically shaped, optical fiber cable consists of three concentric sections: the core, the cladding, and the jacket. The innermost section, the core, contains one or many thin strands of glass or plastic. A plastic coating which has optical properties, called cladding, surrounds each individual strand. Each bundle is surrounded by a protective plastic jacket. Optical fiber is far superior to both twisted pair and coaxial cable. Optical fiber has the capability of transmitting large volumes of digital over large distances in an accurate, rapid and secure method. It has valuable applications in several data communication areas, including long haul loops, metropolitan trunks, rural exchange trunks, local loops and local area networks. (Stalling, 1994, pp. 75-79)

(4) Terrestrial Microwave

Terrestrial microwave systems consist of a line-of-sight communications path between two microwave antennas. The microwave antennas focus a narrow beam on the receiving antenna. In order to extend the range between antennas and to transmit over obstacles, antennas are usually positioned on towers hundreds of feet above the ground. Terrestrial microwaves are used as an alternative method for television and voice. Microwave is also used for short point-to-point transmission between buildings, for such applications as closed-circuit television or local area networks. Microwave facilities achieve relatively the same data rates over the same distances as coaxial cable, but with fewer amplifiers and repeaters. (Stalling, 1994, pp. 79-81)

(5) Satellite Microwave

Satellite microwaves are functionally microwave relay stations in the sky. Satellite microwaves link two ground station microwave transmitter/receivers. There are two methods for using satellite microwaves. In the first, the satellite microwave receives information on an uplink frequency from one ground station and retransmits the same information on a downlink frequency to another ground station. In the second, the satellite microwave can retransmit the information on a downlink frequency to several ground stations. Because satellite microwaves are positioned in orbit above the earth, they effectively increase potential communication distances between ground stations. Satellite microwave is an important medium because it has the capability to transmit digital information, television broadcast, and voice over large distances at tremendous data rates. (Stalling, 1994, pp. 81-86)

(6) Radio

Radio has many of the same capabilities and features as terrestrial microwave, but because it establishes an omni-directional communications path, a parabolic antenna is not required; nor is a precision alignment between transmitting and receiving station required. Radio can be utilized to transmit analog information and digital information at data rates in the range of 9600 bits/second. (Stalling, 1994, pp. 86-87)

4. Communication Modes

a. Text-Based Communication

Any form of education will probably use printed material to convey some of the educational content. In a text-based communication mode, printed information becomes the main source of instructor-learner interaction in cases where distance education is mediated through written correspondence.

The use of a paper-based medium assumes that adequate lead time is available for development of course materials and interaction between learner and instruction. It also assumes that an effective means for course distribution and decentralized procedures for testing exists. (Cherry and Renckly, et. al., 1993)

b. Audio Communication

(1) One-way Audio

One-way audio communication medium consists primarily of educational information contained on recorded audio or standard radio broadcasts. Students receive oral instruction via magnetic cassette tapes. It is assumed that no new equipment is available to the learner and instructor and that a distribution system for the audio cassettes exists. (Bramble, 1990, p. 31)

(2) Two-Way Audio

Two-way audio communication medium facilitates the interaction between learner and instructor through several media, including standard one-to-one commercial telephone calls, a speaker-phone, and a conference call (Bramble, 1990, p. 30). As in one-

way audio communication, educational information is contained in oral instruction, this time through the spoken exchange of information between instructor and student.

An audio conference interactively links people in remote locations via ordinary telephone lines. It consists of two-way electronic voice communication between two or more groups, or three or more individuals, who are in separate locations (Dillon, Blanchard, Price, 1990, p. 31). Conference calls allow an instructor to conduct interactive sessions with several sites at the same time (Bramble, 1990, p. 30).

c. Video Communication

(1) One-Way

One-way video technologies communication medium consists of educational information content being presented in a visual format. Instructor-student interaction takes place through communication media such as recorded video tape or broadcasting systems set up to distribute a video signal from a single source to reception sites (Bramble, 1990, p. 31). Typically, one-way video is used in concert with one-way audio. In the case of video tape, the audio is record simultaneously, while for broadcast video, the audio is broadcasted simultaneously.

(2) Two-Way

Two-way video provides simultaneous video transmission between two sites. It will typically incorporate two-way audio. This communication medium establishes a communications link between instructor and learner or groups of learners. This medium facilitates the exchange of educational information in a video and audio format. The most

prevalent form of this medium is video teleconferencing, which enables immediate instructor/student feedback. (Bramble, 1990, p. 32)

d. Computer-Mediated Communication

One of the most recent technical advancements in the field of distance education has been computer-mediated communication (CMC). CMC is the use of computer and communication technology to facilitate distance education. Wells writes, "CMC is a means to establish an electronic environment. . . . Students and an instructor use their personal computer and modems to connect to a central host computer that is running conferencing software program" (Wells, 1990, p. 1). CMC also expands to include on-line disk-based tutorials, such as Computer Based Instruction (CBI)/Computer Aided Instruction (CAI). With the proliferation of the Internet, the World Wide Web (WWW) and Web Browser software, the definition of CMC can easily be expanded to include interactive/multi-media educational software running on host servers.

In only a few years, this technology has become capable of the following uses:

- Facilitating course-related or social interaction between peers
- Facilitating collaborative group work by distance students
- Facilitating instructor-student interaction
- Decreasing turnaround time for instructor feedback
- Allowing students access to online resources
- Enabling students to upload and download assignments and take online quizzes and tests

Actual applications of CMC educational programs vary, depending in large part on the level of resources incorporated. At the low end, students may receive course instruction via an on-line CBI, whereas a high-end system may encompass the resources of full motion video and audio features carried across the Internet through the use of World Wide Web.

(1) Electronic Mail (Email)

Electronic mail is a communication technique which utilizes computer networks, local-area and wide-area, much like the postal system. E-Mail enables the instructor and student to exchange information that may contain text, graphical, and even audio and video across the network. E-mail has two great advantages: 1) interaction can occur almost immediately, and 2) communication is asynchronous. The fact that interaction is asynchronous enables the instructor and student to interact without having to be on the network at the same time. Thomas states, "students and teachers can exchange group E-Mail messages that encourage team learning and allow the teacher to act as a simultaneous mentor to multiple students in diverse locations." (Thomas, 1995)

(2) Computer Conferencing

Recent advancements in computer technology have spawned the development of many different computer conferencing projects. One such technology, known as Multicast Backbone (MBONE) (Casner, 1993), is currently implemented as a virtual network. It is layered on top of portions of the physical Internet to support routing of its Multicast packets. These rapidly growing technologies provide many-to-many network delivery services for applications such as audio, video, text, and graphics in a conferencing setting, with several hosts communicating simultaneously. Multiple

simultaneous communications enables computer conferencing to move past conventional teleconferencing.

(3) Hypermedia

The words hypermedia and hypertext are often used interchangeably. Hypertext systems allow the use of information in not only plain-text form, but in other forms, such as graphics, sound, animation and/or video. Hypertext has active cross references and allows the reader to move to other parts of the database. Hypertext is considered a database: information is not stored sequentially, but is structured much like an administrative database.

Hypertext information is characterized by three features. The pieces of information, or parts of the database, are called nodes; the cross-references between nodes are called links, which are usually displayed in a different color than the rest of the text; the two combined make up what is called a hyperdocument.

This form of accessing information is much like the learning skills developed in the cognitive process of adult learning. Instead of being forced to learn material in a predetermined, sequential fashion, learners can move throughout the material as they choose. Learners become involved in discovery learning; they develop and redevelop, on their own, the knowledge contained in the material.

Hypertext and hypermedia have become pervasive in the communication of information on computers. The technology is appropriate for delivering large amounts of information. hypermedia is the technology used to interpret and display information on the World Wide Web (WWW).

(4) The Internet

Almost from the onset of the development of the modern computer, there was a need to exchange information between machines. At first, this was done by recording the information on a magnetic tape or punch card and physically transferring the medium to the other machine.

In the early 1960s, scientists across the country started to discover ways of connecting computer and their users. The U.S. government in the mid-1960s started to realize the impact computers would have on education and the military. Thus, the government funded an experimental network that would connect remote research and development sites for the exchange of information. The U.S. Advanced Research Projects Agency (ARPA) was consequently established. The major impacts of ARPA's research were the development of a network protocol and the encouragement of educational institutions to connect to this network. These developments led to what we know today as the INTERNET.

One of the newest Internet services is the World Wide Web (WWW), which was created by CERN (the European Laboratory for Particle Physics). Prior to this development, in order to retrieve and display a document located on a remote computer, one had to know a difficult programming code. The Researchers at CERN wanted a quick system that would access all types of information with a common interface, that would automate some of the tedious steps for retrieving the information.

As CERN began to publicize this development, other organizations began to design WWW interfaces, known as browsers. Browsers are applications that know how to find, interpret, and display WWW documents. Because documents on the WWW are hypermedia

documents, the Internet now becomes a vehicle for transporting hypermedia documents to remote locations.

(5) Computer Based Instruction

Computer based instruction (CBI), sometimes called computer assisted instruction (CAI), presents the educational content in an interactive computer program, usually stored on magnetic, optical, or magneto-optical media, and which may be copied to the fixed disk of a personal computer. It is characterized as an on-line computer instruction program equipped with text, graphics, animation, video and/or sound to deliver the course material.

As asserted by Alessi and Trollip, instruction is made up of four phases: presenting information; guiding the student; practice; and assessing student learning. There are five major types of computer based instruction (CBI): tutorials assume the role of the instructor by presenting information and guiding the student through the instruction process; drills and games engage in the instruction process by requiring the student to practice for fluency and retention; tests are usually embedded within a section or at the end of a lesson to asses the level of learning, to provide immediate feedback and evaluate the students progress; simulations are more complicated, they generally provide any combination of the four phases of learning, and very seldom will a single lesson encompass all for techniques. In situations where a computer is responsible for total instruction, the program must encompass all for phases of instruction. (Alessi and Tollip, 1991, pp. 2-15)

The authors also assert that CBI's takes advantage of a computer's capabilities in situations where instruction costs are high, the material benefits from multimedia interaction,

and logistical difficulties are encountered in traditional methods. (Alessi and Trollip, 1991, pp. 5-6)

IV. RESEARCH ON CURRENT APPLICATIONS

For any new distance learning program to successfully replace MCI's current correspondence program, it must be capable, at a minimum, of achieving the education and training objectives of its predecessor. The current MCI correspondence course has two key objectives. The first is to provide occupational specialty courses which give individuals the tools they need to enhance their proficiency and, thus, improve their job performance. The second is to provide professional military educational courses, also designed to enhance individual proficiency, but which do so by increasing military knowledge.

A distance learning program designed specifically to replace MCI would have to continue to target the education and training of the individual, as opposed to that of the group. This statement recognizes the fact that MCI's correspondence program is but one part of a larger Marine Corps education and training strategy. To do otherwise would exceed the current scope of MCI's mission objective. At this time, the Marine Corps does not intend to increase MCI's education and training responsibilities.

A. MCI'S GOAL

An examination of the Marine Corps Institute's correspondence course program reveals its targeted areas of education and training, as well as its intended recipients of the education and training provided. The program targets the training and educational needs of the individual military (active and reserve) student. The correspondence course's nearly all-

inclusive packet of materials (printed text, answer sheets and addressed mailing envelopes), its self-paced instruction, and its use of the U.S. mail service as its course distribution system (which theoretically guarantees delivery to everyone, virtually anywhere in the world) all point to the program's intent of ensuring access to MCI's education and training resources.

The Marine Corps' view that MCI's role is to provide a limited portion of a much larger overall military education and training strategy is reinforced in the stated purpose of the MCI correspondence course program. The purpose, according to Terry Franus, chief of the Education and Operations Department at MCI, is to "fill the gap between formal schools and what the Marine needs to know to perform in the unit." In the past, filling that gap had been the responsibility of the individual unit, to be performed as on-the-job training. Unit leaders from the Fleet Marine Force (FMF), which consists of Marine Corps operational units, did not feel on-the-job training adequately fulfilled the education and training gap. After examining the use of on-the-job training in this manner, the Marine Corps decided a more formal instructional methodology was needed, and that it could be provided by MCI's correspondence program. The belief was that semi-formal instruction would be more effective for this task than on-the-job training would be.

The Marine Corps' overall education and training strategy is orchestrated by the Marine Corps Combat Development Center (MCCDC), MCI's senior organization. While it is true that MCI is responsible for providing post-basic education and training for Marines, it is important to note that this is very much a shared responsibility. MCI is one part of a much larger overall education and training strategy that includes the use of formal residence schools, on-the-job education and training, independent professional military reading, live

operational exercises, and computer-aided modeling and simulation efforts. MCI is considered an important part of that strategy.

B. THE MCI STUDENT

In examining the organization's purpose, an important fact should not go unnoticed: MCI targets the individual student. The nature of MCI's instruction is such that they attempt to address a diversity of educational and training needs. The Marine Corps does not attempt to meet the needs of only a particular occupational specialty group, such as infantrymen, supply personnel, or aviators. Nor does it attempt to force classes of students into a synchronous, online period of instruction, such as that which would be used in audio or video teleconferencing endeavors. Collaborative unit, organizational, and operational education and training requirements are developed and implemented by the Marine Corps Combat Development Center (MCCDC).

Before recommending a new or improved distance learning program, it is important to understand the characteristics which further define the potential military student. Potential MCI students are often moving targets. Students are almost guaranteed to make a permanent change of location once every two years. Students can be deployed to remote locations, or they may have jobs that require them to spend much of their time on the road.

The education level of the military students participating in MCI's distance education program varies from a high school diploma to post-graduate degrees. This point highlights two common misconceptions: that all officers have baccalaureate degrees, and that no enlisted service members hold an undergraduate or advance degrees. While officers without

college degrees and enlisted service members with undergraduate and postgraduate degrees do exist, both exceptions to the rule probably account for less than one percent of their respective total populations.

Since the use of information technology, to include computers, is an important consideration of this research, it makes sense to investigate the level of exposure to computers (and therefore information technology) of the potential Marine, i.e., MCI student. While actual data indicating competencies or experience level of individuals with computers specifically within the military was not available, related information, such as nationwide student exposure to computers in the schoolhouse, was available. In a survey of 83,283 elementary and secondary public schools by Quality Data Education (Quality Education Data, 1991), it was determined that the numbers of computers in schools greatly increased Microcomputer density (the number of students per computer) was 20:1 in 1990-1991, an increase from 125:1 in 1983-1984. In fact, the percentage of U.S. schools with microcomputers reached 98% in 1990-1991. A 1991 report from the United States Department of Commerce, Bureau of the Census indicated that, among children 3-17 years of age, 46% used a computer at home and/or at school, a rise from 30% in 1982 (Kominski, 1991).

A study performed in 1990 observed that computer software has been integrated into the classroom in the following manner: (1) text processing tools (95 %); (2) Instructional Software (89%); (3) analytic and information tools (87%); (4) programming and operating systems tools (81%); (5) games and simulation (81%); and (6) graphics and operating tools (81%). (Brennan, 1991)

This data leads to certain logical conclusions: that the average service member is exposed to computers and related technology at an earlier age than ever before, and that this phenomenon is continuing to increase. Given these facts, the service member is apt to be more knowledgeable in the use of microcomputers and their telecommunication needs. They may well come to expect the presence of computers in their day-to-day activities, especially in their learning activities.

C. SELECTED APPLICATIONS

1. On-Line at the Prudential

In 1992, as part of a reorganization, the Prudential Company reevaluated its methods for training its representatives. Previously, the training program was book- and classroom-based. After completing a survey and research process in late 1993, the company's field education and development division created the Prudential Learning System (PLS). (Trumfio, 1994, p. 41)

To access PLS, Prudential's 16,000 representatives use their PCS or special learning terminals to connect to a host computer, where proprietary PLS courseware resides. The connection is made via a modem, communication software, and a 800 number. (Trumfio, 1994, p. 41)

Prudential's representatives will be able to complete 75% of their in-house training on their PCS or special learning work stations. PALS is expected to be fully implemented at the end of 1995 and will feature more than 60 courses. Core selling skills, Prudential's

products, quality service, prospect management, and selling to niche markets are just a few of the topics currently available. (Trumfio, 1994, p. 41).

PALS has a core curriculum of 25 to 30 courses. Local managers can adjust the sequence of courses to fit the needs of a specific representative. New representatives are required to complete the core courses within 30 months of being hired by the company. Upon completion of the core curriculum, 75% of the PALS training is complete. The remaining 25 percent of PALS is dedicated to veteran representatives, who can choose for themselves courses best suited to their personal growth. Specialized courses such as business marketing, estate planning, and estate conservation comprise this group of courses. (Trumfio, 1994, p. 42)

2. Honeywell's Computer-Based Instruction

The Industrial Control Division of the Honeywell Corporation designs and installs industrial automation and control systems. This division has designed and utilizes 3.5 inch magnetic-disk-based courses internally as a prerequisite for their Automation College. These courses are used to instruct over 600 managers, sales personnel, network specialists, and technical consultants in four special course programs: data communications essentials, Local Area Network (LAN) operations, unix awareness, and unix fundamentals. The interactive programs employ text, sound, graphics, photos and animated pictures incorporated with questioning and feedback techniques. (Kinsley, 1994, p. 34)

3. Public Broadcasting Service (PBS) Adult Learning Service (ALS)

In 1981, the Public Broadcasting Service (PBS) began providing distance learning opportunities for adult learners across the country by delivering college-level telecourses, live, interactive videoconferences and resource programming. The program, named Adult Learning Service (ALS), has delivered telecourses to over 2.8 million students who have earned college credits. (PBS, 1995)

Public television stations, in partnership with local colleges and universities, broadcast ALS telecourses. Students are given the flexibility of enrolling in college courses without having to be on campus. Stations also have the flexibility of working with local educational institutions to promote and deliver courses that best serve the needs of the community.

The courses are delivered in several media:

- Telecourses include complete video and print packages, covering a variety of academic disciplines;
- Audiovisual resource programs include some of PBS's prime time programs, which can be used in classrooms, libraries, and training programs;
- Live, interactive videoconferences enable organizations to host local discussions featuring cutting-edge issues in education, business, health, and other fields.

In 1988, ALS expanded its service by establishing the Adult Learning Satellite Service (ALSS). ALSS delivers, via satellite, a broad range of educational programming directly to colleges, universities, businesses, hospitals, and other organizations with satellite equipment. ALSS compliments ALS by providing a non-broadcast programming service to these organizations. (PBS, 1995)

A specialized application of ALSS is The Business Channel (TBC). TBC provides direct satellite service focused specifically on business education and training. Programs include live, interactive videoconferences on vital changes in the business environment. In addition, it delivers training and resource programming.

4. The Open University of The United Kingdom

Founded by a Royal Charter in 1969, the Open University is presently Britain's largest university, with 200,000 students. There are 132,00 studying undergraduate- level courses and an additional 10,000 students pursuing postgraduate degrees. The remaining student population pursuing continuing education in Open University's professional development programs in management, education, health and social welfare, manufacturing, and computer application. (Open University, 1995)

The Open University differs from most educational institutions in two respects. First, it is open to virtually any adult living in the U.K. or in other members of the European Union. Second, the Open University goes directly to the student via the postal service, computer, and national British Broadcasting Company's (BBC) broadcasts. (Open University, 1995)

At the heart of most Open University courses are printed textbooks or workbooks, specifically designed for the independent learner. In conjunction with printed material, course material may include: special home equipment loaned for practical work; audio and video cassettes produced by Open University and the BBC; and computer-aided instruction software. Open University utilizes the BBC's national broadcasting network to deliver its courses via radio and television broadcast. (Open University, 1995)

Some courses also include a one-week residential program usually held over the summer at one of 13 regional Open University campuses. These campuses are important because they enhance the educational process with additional tutelage, group tutorials, and counseling provided on campus. (Open University, 1995)

5. Program for Afloat College Education (PACE) II

The U.S. Navy's Program for Afloat College Education (PACE) was established to provide Sailors and Marines deployed aboard Naval vessels the opportunity to take accredited college and pre-college courses while at sea. The courses are fully accredited and transferable to major colleges and universities. The cost to the Sailors or Marines is merely the cost of the textbook. Initially, instruction was accomplished by deploying a civilian instructor aboard ships to teach the classes. This form of instruction continues and is performed by Central Texas College.

In 1987, the PACE program was augmented by the PACE II program. PACE II grew out of the necessity to deliver the same college level courses to the Navy's submarine force, where on-site instructors could not be accommodated. PACE II gave submariners the opportunity to complete these courses, delivered by microcomputers and video-cassette technology. Over the years, the program has expanded to include courses delivered by video-based, audio-based, and interactive computer software. (Middlesex Research Center, 1995)

The Navy also has the capability of deploying this program to remote shore stations such as Antarctica, where its pilot program has been very successful. The Navy deployed PACE II to the McMurdo Sound in October 1993. The course delivery system facilitated registration and course administration via satellite, library access and student-instructor

interaction via the Internet, and submission of examinations and term papers via computer and the Internet. (Middlesex Research Center, 1995)

6. The Ohio Aerospace Institute (OAI)

Established in 1989, the Ohio Aerospace Institute (OAI) functions as a collaborative distance education program. It unites the educational resources of university, government, and industry utilizing a two-way interactive video network. The installed network delivers engineering courses from member universities throughout Ohio to employees of NASA Lewis Research Center in Cleveland. It also facilitates collaboration among universities on co-taught courses and course sharing, and enables sharing of respective areas of expertise. (Burkett and Daugherty, 1995)

The backbone of OAI's collaborative vision is its Interactive Video Network (IVN) and the 11 distance learning classrooms. The IVN links the engineering departments of the nine universities with each other and the OAI. The IVN is a two-way interactive systems that utilizes compressed digital video/audio technology. At each of the nine universities and two training sites, OAI has installed video classrooms deliberately designed to reduce maintenance and simplify troubleshooting. (Burkett and Daugherty, 1995)

Instruction is provided both on-site by live instruction and remotely by interactive video, using the IVN classrooms and telecommunications capabilities. Future plans for the IVN include an increased number of graduate-level courses. In addition, an increased offering of continuing education programs will be provided in the form of workshops, conferences, lectures, and seminars. (Burkett and Daugherty, 1995)

7. University of Phoenix On-line Division

The University of Phoenix On-line Division in San Francisco offers undergraduate degrees in Business Administration and Management and graduate degrees in Business Administration, Management, and Business Administration/Technology Management. The degrees are offered entirely through computer conferencing.

Once enrolled, each student participates in an on-line orientation to learn how the computer conferencing system works. The university then mails textbooks, detailed course guides explaining assignments, reading assignments, and course outcomes and objectives. (Kruege, 1995)

Students then use their computers, modem, and communications software to log on for computer conferencing sessions. On-line students participate in class groups composed of 8 to 12 students from around the country. Each week, the instructor provides students with information on the week's topics and assignments, such as textbooks readings, case study information, or details for preparing a paper. The instructor may also post lecture notes, give elaborating information on the material, or provide discussion questions. Students are not required to be on-line at a specific time. Rather, they complete the course work off-line, and then go on-line to send and receive material to and from the class group. (Kruege, 1995)

The on-line courses are not self-paced or open-ended. There is a beginning and an end date to each course, and there are deadlines assigned for each homework assignment, reading, and on-line discussion.

The faculty of the University of Phoenix On-line division must go through a detailed assessment and training program. The credentials of candidate instructors are thoroughly reviewed, and interviews are performed to ensure they have the professional experience and capacity to teach in an on-line format. Each instructor receives a two-week training program on-line, where instructors learn on-line facilitation skills, tips and techniques of on-line instruction and interaction, and university policies and procedures. (Kruege, 1995)

8. Net-Frog: Frog Dissection Using the World Wide Web (WWW)

Created by members of the University of Virginia's Instructional Technology department, Net-Frog is a laboratory dissection experience on-line, using the Internet, the World Wide Web (WWW), and hypermedia documents. Preserved and pithed specimens are depicted using color images to visualize the frog's anatomy. Full motion video is used to demonstrate dissection techniques and information that is unavailable from still photographs, such as how to hold forceps when folding back the frog's skin, or how the frog's lungs inflate. The instruction, in the form of hypermedia documents, is interactive, asking users to point and click to identify internal organs and critical locations for dissection procedures. Immediate feedback is provided, and the user is given the opportunity to practice prior to attempting the procedure for a grade. Due to its widespread distribution capability across multiple platforms, this instructional method has become very successful. Many students have been given the opportunity to simulate dissecting, prior to actually performing the task. (Kinzie et al, 1995)

V. PROPOSED INFORMATION TECHNOLOGY (IT) IMPROVEMENTS

A. OBJECTIVES

The purpose of this chapter is to illustrate a possible implementation of information technology improvements for MCI. Given the description of MCI's program intent and current operations (Chapter II), general characteristics of distance education and its recent technologies (Chapter III), and the anecdotal evidence of distance education performance (Chapter IV), this chapter will make recommendations for specific MCI uses of distance education technologies. The presented recommendations explain which technology should be used, and how it should be employed in order to improve the effectiveness and efficiency of MCI's Correspondence Course performance.

The first section of this chapter discusses implementation concerns considered prior to developing the recommended courses of action. Following that section is a description of the recommended process and program improvements. A model for course development is provided in Subsection 2. The chapter concludes with a description of the potential benefits achieved by the IT improvements.

B. GENERAL IMPLEMENTATION CONCERNS

A report by 30 key educational administrators, distance educators, and program providers revealed 20 factors felt to be critical considerations when planning a distance education program (Lane, 1993). The factors identified were:

- Identified need (perceived or real) for the program
- Faculty and teachers supportive and given incentives for motivation
- Funds for capital costs, production, equipment, facilities
- Availability of ongoing money for operations and expenses
- Quality of the education content of the program (evaluation)
- Adequate support staff to produce the program
- Ensuring equivalent learning experience to remote students
- Enthusiasm and belief by the institution in the overall distance education project
- Identification of a visible, spirited key leader/administrator initiating program
- Adequate receive sites, facilities and staff
- Availability of appropriate and specialized equipment to deliver programming
- Sufficient time for careful analysis; identify the range of services and programmatic needs
- Ensuring equivalent status for remote students; i.e., credit, degree, etc.
- Instructional design and TV production : interactive components, length, frequency and number
- Identification of a marketing plan for the network, system or program; public relations
- Cost effectiveness: feasibility and justification for delivery system to students and institution
- Identified support/partners for the program: industry, corporate, legislative, institutional

- Ensure continued credibility of the program with the public, faculty, students, and supporters
- Knowledge of educational administrators, teachers and staff at educational institutions on what distance education is and how to teach and use it effectively
- Ability to accredit course, offer credit or transfer credit across states or institutions

To make this information more manageable for analysis, these factors were summarized into five areas of concern. These five areas provide a framework of issues considered critical to the implementation of a successful distance education program.

1. Adequately Planned Lead Time

To give procedural and/or program improvements the best chance of succeeding, MCI must set aside adequate time to plan and execute the strategic and tactical actions necessary for a successful distance education program. Failure to do so could result in the execution of partially-completed, poorly-thought-out procedures and programs, and this surely would hurt the cause of the overall project. When planning lead time, it is necessary to first plan sufficient time to collect program requirements (including reviewing those requirements for validity), and to design and evaluate improvements.

It may be said that MCI is already aware of its program requirements for providing distance education; however, that doesn't take into account that many of MCI's current problems arise from the failure to consider how system requirements interrelate, as a whole. In other words, MCI must understand the interrelationships among program

administration/management, course design and development, and distribution as program requirements are developed.

2. Availability and Affordability of Technology

Once requirements are defined, in the case of distance education, it becomes crucial to select the appropriate hardware, software, storage media technology, and telecommunications for implementing the distance education program. A baseline assessment of current resources must be conducted to determine the present capacity of the existing information technology. To reduce the risk involved in program development, currently available and mature IT solutions should be employed, versus systems or technologies that are under development.

Availability of technology also applies to the need to plan for students' access to the system. While it may seem obvious that a system should include a plan for student access, it is important to consider this concept comprehensively. Student access to hardware, software, telecommunication means, where the student may participate in the program, and under what conditions, all are factors that must be considered.

The term "affordability of technology" refers to the need of system developers to be aware of a system's value, and their responsibility to ensure that the cost of the selected technology logically coincides with the perceived value of the proposed system. Designing a system with technological components that exceed the value associated with the system itself, is a waste of limited funds and invites criticism of the overall system design. The correct sequence in determining affordability would be to first determine user requirements,

and to then determine the value of those requirements. Based on those determinations, a rational decision about the cost of technology is now possible.

3. Required Skills for Development

MCI's consideration of the use of IT requires a redefinition of the individual skills and roles required within the organization. The new technology will require a wide range of skills and abilities, which may not be present within the organization.

Once the necessary abilities and skills have been identified, the organization can either train existing personnel in those skills or hire new personnel who already possess those skills. This shift in skills and abilities may range from course developers having to learn new techniques for course development or to address course content issues, to instructors developing different forms of interaction between students, based on the form of media selected to mediate the new course of instruction.

4. Abilities Required By Students to Participate

If information technology is to become the primary interface between student and the instructor or source of instruction, then students must possess the skills to operate within that environment. For planning purposes, an institution must first determine what skills potential students possess. This information will ensure that the institution does not arbitrarily create a program that is beyond the students' capacity to participate. In this case, the system can be designed to include student support features, such as text-based or on-line instruction, training courses, or some form of "Help Desk."

5. Overall Effectiveness

The term "overall effectiveness" implies that it is necessary to measure effectiveness in more than just one area of an organization's performance. Declaring a distance education program a success based solely on improved test scores can be a correct assumption only if the sole objective of the program was to improve test scores. At best, improved test scores are just one indicator of the success of a program. A much better indication of a distance education program's effectiveness would be improved test scores combined with the exhibition of students' abilities and skills directly attributable to instruction. To determine the effectiveness of an entire program, an institution must identify comprehensive goals in the program's critical areas, preferably in the form of measurable objectives.

C. OPERATIONAL IMPROVEMENTS

In Chapter II (Section F, Subsection 2), the problems of achieving timely student enrollment and accurately tracking student course completion status were identified. Operations suffered from mail delays in information transfer, data entry errors (due in large part to the labor-intensive nature of data entry requirements), and errors in automated information system retrieval. It was stated earlier that due to the expected increase in student enrollment (January 1996), these problems, if not resolved, represent potential program breakpoints.

1. Database Reengineering

This thesis proposes that these problems be resolved by reengineering MCI's information exchange and storage processes. It is recommended that MCI adopt the use of

a relational database for information exchange, retrieval and storage processes, and that this database be supported by a centralized telecommunications system which processes information directly between MCI and units participating in the Correspondence Course Program.

MCI's current automated information management system is a collection of flat file databases and segregated applications which receive only data entered by MCI's personnel. No relationships have been created amongst the data in different files, which makes the data in the databases separated and isolated. This makes efficient generation of management reports using data from different collocated files impossible. Data integrity is constantly in question as a result of the duplication of data and redundant files. MCI database users often are unable to get the information they want, except by printing out several files and manually cross-checking data, and Unit MCI Clerks have no access to the data.

A relational database would resolve these problems by improving MCI's ability to maintain and manipulate data and to get specific information on demand, which could be used to support management decisions. It could eliminate many of the labor-intensive hours currently required to achieve data integrity and retrieve needed information, such as cross-checking across several redundant files

MCI has a choice between developing its own product or purchasing an off-the-shelf database application. Based upon the research conducted to date, MCI's requirements for data exchange, storage and retrieval are not unique, and it should be able to locate off-the-shelf database applications capable of meeting its needs. An effort should also be made to capture data already existing in the current system's databases, but sometimes the benefits

of such an effort are outweighed by the expense. A more prudent course of action may be to completely build the new database from scratch. Deciding the best course of action depends on factors such as the software language used and the quality of documentation existing in the software. A cost-benefit analysis will undoubtedly be required.

2. Direct Unit Telecommunication Access

To reap the most benefit from the use of a relational database, it is recommend that units outside of MCI have the ability to read and update data in the database. The data in question is data that the units originate, such as student demographic data and enrollment requests. Using dial-in modems, units would access a centralized, relational database and personally update data fields such as student enrollment (meaning whether a student is actually taking a course), disenrollment, transfers, reception of diploma, etc.

Actions such as this would reduce the labor-intensive requirements of many of MCI's processes. For example, instead of having only six clerks processing the 1500 Unit Activity Reports, each of the 1500 units would ensure the integrity of its own data describing its individual personnel. Units would be denied access to fields deemed inappropriate, such as exam scores and course completion status. MCI student operations personnel would be able to focus more on supervision and less on data entry.

D. COURSE IMPROVEMENTS

1. New Media

The proposal suggests the development, production and distribution of computer-based instruction (CBI) and hypermedia (interactive CD-ROM disk or Internet) courses. It is also

recommended that alternate methods for student access, such as computer learning facilities and Internet course access, be developed and implemented. Beginning with the proposal for new media, the use of CBIs and hypermedia recognizes the potential of this media to enhance the effectiveness of MCI's distance education program. Based upon the research conducted, the selected media alternatives display the characteristics required to satisfy the learning needs of MCI's students, and facilitates the processes and procedures of the distance education program.

The proposed media combination retains the desirable traits of the current text-based correspondence course program, while adding qualities which, potentially, can improve program effectiveness and efficiency. The qualities referred to include the following attributes and favorable conditions:

- reduced volume of course materials (disk versus text-based), facilitating mail distribution
- self-paced instruction, allowing individual students to learn at their own pace
- immediate instructor-to-student feedback (computer-administrated and graded exams)
- portable course materials so that materials can follow students
- enhanced course-generating capability through use of support tools (authorware)
- less labor-intensive inventory control (inventory of disks versus texts)

Computer-based Instruction and hypermedia (interactive CD-ROM disk or Internet) versions of current occupational specialty and professional military education courses would be developed using authoring systems and HTML editors. Whether it would be best to develop a particular course in a specific media has not yet been decided; this would be a

topic for further study. Using these systems, MCI instructional developers could, without knowledge of a computer language, develop and generate text and graphics lessons on a computer. CBI and hypermedia courses could be designed to include not only the exams, but also the ability to grade the exams and provide the student with the results. Though current course development personnel would not have to know a computer language to produce the new courses, they would have to learn to use the authoring and editing tools. Section F provides more guidance on course development.

To establish hypermedia courses on the Internet, MCI would have to purchase the necessary hardware and software to become an Internet host server, and establish an Internet point of presence. This could be done by using existing Department of Defense Internet points of presence, or via a commercial contract. Once courses were developed and produced, and the Internet connection was in place, MCI would place courses on the server to be accessed on demand. Because of the different requirements for Internet connection worldwide, unit Internet connections to MCI should be researched thoroughly to make the best possible selection, based on accessibility, throughput requirements and cost.

To get the necessary instruction, MCI personnel could attend commercial training or hire qualified personnel to provide in-house instruction. Alternatively, course development could be commercially outsourced, where the use of authoring systems by personnel more experienced in programming and software development would be optional. The choice of method should be based on an analysis of factors such as: the strategic need to retain organizational core competence in course development; current and anticipated personnel skills; and in-house versus outsourcing cost-benefit analysis.

2. Course Development Model

Of the several courseware design models reviewed during research, the most comprehensive and effective is one developed by Roblyer and Hall (1985). The model incorporates three phases, each having several steps. A step may or may not have activities which must be completed before progressing to the next step. The model is presented generically, so that it may be utilized for the development of computer-based instruction and hypermedia.

To effectively use this model in developing courseware, MCI should assemble a design team for the development of each respective medium. Each design team should contain at least one person from each of the following areas: an instructional design expert with experience in course design and learning theory; a subject matter expert who has taught in this area; and a programmer with programming experience in that medium.

The documentation produced in phases one and two become part of the quality assurance effort in the design and development. The information becomes a blueprint of the product, giving the design team a clear picture of the system that is to be developed, prior to coding. The following is a description of the Roblyer and Hall (1985) courseware design model, as described by Roblyer in David Johassen's (1988) book entitled *Instructional Designs for Microcomputer Courseware.*

Phase I: Design

Step One: State Instructional Goal

Compare present needs with current forms of instruction to determine where proposed technology could be applied. MCI's needs a clear indication of the current problems and how the two technologies may help address them.

(1) Problem Analysis

The design team: 1) agrees on the instructional problem(s) to be addressed, focusing its attention on some of the factors causing the problem(s); and 2)determines if there are features of the technologies that can resolve the problem(s). An MCI team would focus on problems in delivery of course materials and student-to-instruction interaction.

(2) Identification of Student Characteristics

The team collects all relevant characteristics of the MCI student, including grade and reading level. Specific attention is paid to computer skills that will enable the learner to utilize the proposed system.

(3) Development of Goal Statements

The team develops, in writing, general statements of the overall goal of the topic area to be covered. These statements, used later in the design sequence, help the team determine what the MCI student will be able to accomplish as result of the instruction, versus what the instructor or computer will do for the student.

(4) Definition of Instructional Setting

The team must have a clear understanding of how and where the eventual system will be employed. An MCI team would work from the premise that instruction is individual-based and must be able to reach a marine anywhere.

Step Two : Instructional Analysis

(1) Developing a Learning Map

The team: 1) analyzes each stated goal and determines the skills required to successfully achieve them; and 2) uses a concept known as learning maps, graphical representations of the relationship between the related goals and skills.

(2) Determination of Prerequisite Skills

Based on the knowledge of the students anticipated to participate, the team determines: 1) the entry level for which the course will be developed, essentially the point at which instruction will begin; and 2) the prerequisite skills for those using the course materials.

Step Three : Develop Performance Objectives

The team develops precise instruction objectives, outlining what the student will be able to do given a particular condition. These become important in step five because they are used to determine and evaluate development strategies.

Step Four : Develop Testing Strategies

(1) Determine Testing Needs

The team should assess the testing requirements of the course. Preliminary analysis recommends that testing focus on post-test for evaluation purposes. There is no current pretest curriculum requirement for determining placement or learning readiness. Imbedding test questions within the instruction may improve student/content interaction.

(2) Development of Test Items

The team should: 1) choose suitable test formats to match each form of test given; and 2) produce actual tests, written specifically to meet the stated objectives in step three.

(3) Determination of Reliability and Validity

The team should develop measures to insure that test items accurately and consistently measure a marine's performance.

Step Five : Design Instructional Strategies

In order to ensure that students attain the required skills, the team now designs strategies based on the objectives determined in step three. If the team cannot successfully match the instructional design to these objectives, the team must utilize the revision cycle, an iterative process of matching the eventual strategy with the objective of the course. The team also will prepare descriptions of the media, materials, and distribution strategies of the course material, as well as identify support material and media (i.e., course instruction materials and users manual).

Phase II: Pre-programming Development

Step One : Develop Flowcharts and Storyboards

In this step, materials are developed to clearly communicate to the programmer the desired presentation of the instructional material. These materials include: flowcharts to depict the progression of the instructional material; storyboards to relate what the instruction should look like; and courseware authoring tools, for both CBI and hypermedia, which will

enable the development team to perform this function. Although many revisions will be made later, it is important to develop a blueprint of the of the instructional course.

Step Two : Develop Support Material

Course supplemental materials matched to those identified in Phase I, Step five must be designed. The design of the course management system will also be designed in this step.

Step Three : Review and Revision Before Programming

To avoid the time consuming task of re-programming, the team reviews the overall design of the course prior to programming. The team can return to developing flowcharts and storyboards to address any issues revealed in the review process. In this step, other instructors from the content area who are not a part of the design team can review the design.

Phase III: Program Development and Evaluation

Step One : Program First Draft of Course Materials

The programmers develop the screens and sequences, in the case of CBIs, and hypermedia documents, as per the design. Today, many CBI courseware and hypermedia authoring tools are capable of producing course material from the outputs of the design phase. The programmers and the design team should interact to develop presentation mechanisms that reinforce cuing and attention to important details in the instruction.

Step Two : Perform Formative Evaluation

The first draft of course materials are tested with students of the target population. Data should be collected to evaluate the following areas: 1) the performance of the students and their attitudes towards the instruction; 2) the attitudes of the personnel administering the course; 3) on-site observation of marines utilizing the course to identify any problems with

course use or understanding; and 4) interviews with marines to determine their reactions to the material's interest and ease of use. Any revisions to the course material as a result of this evaluation process will be made during the revision cycle.

Given the use of these new media, it is necessary to look at the alternate access proposed.

3. New Course Access Options

Computer learning facilities and Internet course access are appropriate alternatives for several reasons. Combined, these access means can accommodate a large transitory demand for instruction, i.e., a demand that continuously fluctuates from high to low as a result of operational tempo. These access methods also display flexibility in that they adapt to different access abilities. Individuals who participate in instruction can choose the option that best accommodates their available capabilities and their learning preferences.

To achieve this access, it is recommended that computer learning facilities be located at each Marine Corps Base. The facilities would provide students access to a computer network on which they could complete computer-based instruction courses or access to hypermedia courses on Internet, or possibly both.

Operations for these facilities would work as follows: As operational tempo allows, students without access to a computer would use the computer learning facilities. They would log on to the network (only as a result of their individual Unit MCI Clerks having successfully enrolled them in a MCI course) and complete either computer-based instruction or hypermedia courses at their own pace. Students with access to computers at other locations could check out disk-based courses and complete them independently. They

would also have the option of logging on to the Internet from their computer access (getting modem and telecommunication software as needed), and completing courses in that manner.

An existing base library may be an idea location for these facilities because it is already perceived as a common study facility by all base personnel. Due to the recent trends in library reference retrieval, such as electronic resource sharing, a foundation for telecommunication access may already exist, or be on the planning board.

Why develop alternate means of access which may create a more complicated system management requirement? Worldwide, the ability of students and their units to reach MCI (and attain course material) occupies a range of customer convenience. Units permanently stationed at bases are more likely to have greater computer/telecommunication access to MCI than units that deploy (or are deployed aboard ship). Because of the unpredictability of real-world military troop commitments, units' operational tempo varies radically at any particular point in time, ranging from highs to lows.

The conditions described above create a situation in which Marine Corps units have different work environments, resources, personnel skills, and priorities. While it may be best for management and control (i.e., MCI and the Marine Corps) to perceive all Marine units worldwide as having the same abilities to access to MCI course material and the same work priorities, the truth of the matter is that this is not reality. The question, then, is: is it more efficient, cost- effective, productive, and technically feasible to attempt to make everyone appear the same, or is it better to accommodate the differences, within some established range? This is a determination that must be made by Marine Corps training and education policy makers, and represents a topic for further research.

4. Migration Of Improvements

To expect an organization to make a change of this magnitude without some migration plan is unrealistic. To reduce the risk involved in such a change, it is necessary to develop a comprehensive strategy for migration to accomplish the proposed changes. MCI 's migration strategy would require MCI and participating units to: conduct baseline assessments of resources; determine new system/user requirements; design system configurations based on new requirements; and test and evaluate those configurations. Final implementation plans should be developed only after careful consideration of the gathered information, which clearly may cause previously planned actions to be reconsidered.

With regard to the proposed new media, course construction, and methods of accessibility presented here, it is recommended that a prototype implementation be conducted. For example, two scaled-down sites would be implemented and allowed to operate for some predetermined period of time. Though the technologies (computers, computer-based instruction and hypermedia, and new telecommunication paths) used are not experimental, their use in distance education systems/scenarios is still in its infancy. More information (cost, productivity, user satisfaction) is needed in order to make the best decision concerning the Marine Corps' wide implementation of such a strategy.

Without a doubt, for the immediate future--the next two to three years--it will be necessary to continue producing some level of paper-based correspondence courses. Despite the trend toward eliminating paper-based educational material, there may always be a need for paper-based course materials. The number of texts/courses that should be produced, and the duration of such a requirement, are both unknown at this time. Information gathered

from the use of prototype and other analysis of the proposed system would be invaluable in supporting future implementation decisions.

E. BENEFITS

Most of the benefits of implementing the proposed program improvements have already been discussed in the sections on the specific improvements. Generally speaking, the two key benefits of the proposed improvements are better customer service and more efficient use of resources, both human and material (at both MCI and participating units).

Another important benefit, not yet discussed, is that technology may help identify beneficial patterns of human behavior in learning, and, as a result, put the managers of that technology in a position to positively affect learning. The following quote from Gabriel D. Ofiesh, author of *A Report On The Nationwide "State of the Art" of Instructional Technology,* illustrates this point:

> With the speed, power, and storage capacities of the new microcomputers and the sophistication of the information programs, we are on the threshold of having knowledge presented in a way that emulates our thinking, rather than forcing us to think the way information is presented. (Ofiesh, 1990)

With the help of computers and appropriate software, data about learning progress and the results of lesson evaluation (exams and written questions) can quickly be captured for later study. Again using computers and appropriate software applications, the data can be analyzed and processed into information that indicates the general effectiveness of instruction. This information, in the short view (tactical impact), can be used to support management decisions concerning the conduct of operations and the effectiveness of a particular course of study. In the long view (strategic impact), this information can lead to

the design and production of new products and processes that expand human capacity, enhance human reasoning ability, and facilitate information processing that promotes new insight and depth of thinking.

VI. CONCLUSION AND RECOMMENDATIONS FOR FURTHER RESEARCH

A. CONCLUSION

The Marine Corps Institute could increase manpower to offset an increase in student enrollment. However, if the organization continues with business as usual, can simply adding manpower be considered the best use of available resources? When MCI barely manages to function under business as usual, can it really be the most efficient and effective means of operation?

As the information in this paper demonstrates, the answer to these questions is no. The operational problems described in this paper are clearly solvable with the use of existing information technology. Resolving these problems is a matter of determining which technology is applicable, and how best to apply that technology. This thesis offers the concept of a relational database as the most appropriate technology. Providing units direct access (via telecommunication paths) to student status information--to ensure information integrity while simultaneously reducing MCI's workload--is the best application of that technology.

There are many advances in information technology which can provide or improve the performance of a distance education program. Not all of these new technologies, however, are appropriate for use in MCI's distance education program. Based on the research conducted, computer-based instruction and hypermedia courses (to include disk-based, rather than paper-based distribution) were determined to be appropriate technologies for MCI's

distance education program. Their potential benefits explicitly matched the needs observed in the analysis of MCI's correspondence course program, mission, and operations.

Will the recommended program improvements work? Research and experience in business, academia and the military have shown that the use of well-designed technological solutions can improve learning outcomes in shorter times, and that workers acquire competencies that carry over into improved job performance and productivity (Lowenstein, 1990). Still, because the use of the proposed technologies in distance education systems is a relatively new practice, MCI should follow a conservative implementation approach, consisting of prototypes, a continuous process of testing and evaluation, and, finally, incremental implementation. This course of action minimizes program risk and also allows for appropriate inclusion of discoveries.

An important fact does not go unnoticed: the individually-proposed technologies, together in a distance education program, form a system. A system can be defined as a set of interacting and interrelated parts that is best understood by contemplating the whole. One difficulty in assuring the success of the proposed technologies at MCI is that the parts combine in a unique way. Though MCI and its mission are similar to other academic and commercial distance education programs in many ways, the military environment of MCI makes it unique.

The recommendations in this paper are not based on a statistical analysis of current productivity, nor on a cost-benefit analysis of the proposed methods versus cost and productivity data for the new technologies. As stated several times throughout the course of this research, evaluation of organizational performance using statistical data was not

consistently conducted by MCI. And, because of the relative newness of the proposed technologies--e.g., hypermedia learning over the Internet versus traditional methods--research which captures performance statistically is still being compiled. Instead, the recommendations make an attempt to match operational conditions with an appropriate technology, based on the empiric potential of the technology.

B. RECOMMENDATIONS FOR FURTHER RESEARCH

A major stumbling block to the conduct of this research has been the lack of established "metrics." It was easy to determine if an operation was being performed. But, due to a lack of established performance measures, it was difficult to determine how well that operation was performed. MCI's inability to measure the effectiveness of instruction and operations in support of instruction hindered any organizational performance analysis. Justifying recommendations for improvement become difficult when you have no yardstick for performance measurement. Measurements are important for evaluating whether one method or process is better than another. For these reasons, it is imperative that future research include the development of accurate and appropriate performance measures.

Research for this thesis uncovered several areas where follow-up study is recommended before the proposed improvements are implemented. These include the following areas:

- performance metrics
- requirements analysis
- economic analysis

- business process reengineering
- A plan/strategy to assist MCI in incorporating information and telecommunication technologies

APPENDIX A. MCI ENROLLMENT APPLICATION (R-1 CARD)

MCI ENROLLMENT APPLICATION - *Print in Ink or Type* R-1

Last Name *(Please type or print with ink)* INITIALS

Social Security Number

RUC | RANK | MOS

Address

Zip Code

Course Title | Course Number

Military Affiliation *(Check one)*

[ ] USMC [ ] Civilian

[ ] Selected Marine Corps Reserve (SMCR)

[ ] Individual Ready Reserve (IRR)/ Individual Mobilization Augmentee (IMA)

[ ] Other Service *(specify)* _____

Endorsement of Commanding Officer:

This applicant has been screened in accordance with MCO 1560.3 and the *MCI Catalog*.

The following has been verified:

—Meets course prerequisite as stated in MCI Catalog

—If on active duty, has 6 months or more active service remaining.

—Not scheduled for formal school or transfer within next 3 months.

—Not currently enrolled in another MCI course—or, if enrolled, has received final exam.

Signature C.O./Supervisor | Rank | Date

Information concerning Privacy Act of 1974 has been provided

DETACH BEFORE MAILING

Directions for Completing the MCI Enrollment Application

1. Print legibly with ink or type all information.
2. Name and Social Security Number must be correct.
3. "RUC" is five digit reporting unit code, *not* zip code. (USMC only)
4. "RANK" is for military only.
5. "MOS" is occupational specialty designator (USMC only)
6. Address:
   Active Duty, Except Air Force - Military address.
   Air Force - Base education office address.
   SMCR - Reserve Unit address.
   IRR - Home address.
   IMA - Home address.
   Civilian - Military activity address.
7. Course title and number must match. Check catalog.
8. Your military affiliation must be shown. Write out explanation of "other."
9. Ensure signature block is completed and dated.

APPENDIX B. UNIT ACTIVITY REPORT (UAR)

MARINE CORPS INSTITUTE UNIT ACTIVITY REPORT	MONTH ENDING	UNIT TITLE	RUC
	JAN 1991	MCI CO	54906

MCI-R55D (P)

LINE NO.	NAME SOCIAL SECURITY NO.	COURSE NUMBER	NUMBER OF LESSON IN COURSE PASSED/FAILED	STUDENT STATUS/REMARKS	COURSE COMP. DEADLINE	UNITS AUDIT COMMENTS
			SEE AUDITING INSTRUCTIONS			
10	KILO 569083744	LL 7500		COMPLETED COURSE	01DEC89	
11	KILO 569083744	LL 7515		COMPLETED COURSE	02DEC89	
12	KILO 569083744	LL 7700		ENROLLED	10JAN92	
13	KILO 569083744	LL 7701B		ENROLLED ISSUED EXAM	10JAN92	
14	KILO 569083744	LL 7703		ENROLLED ISSUED EXAM	10JAN92	
15	KILO 569083744	LL 7705A		ENROLLED ISSUED EXAM	10JAN92	
16	KILO 569083744	LL 7706		ENROLLED ISSUED EXAM	10JAN92	
17	SMITHSTER 123456789	U 1334G	1 P	COMPLETED COURSE ISSUED EXAM	29NOV89	
18	SMITHSTER 987654321	Z 441F	123456 PPP	COMPLETED COURSE ISSUED EXAM	14NOV89	
19	SMITHSTER 111223333	ZZ 0365B	12345	ENROLLED FROM GROUP ISSUED EXAM	25APR90 EXT	
20	SMITHSTER 555667777	PM 0325E	1 F	FAILED COURSE REENROLLED	21MAR91 REEN	
21	SMITHSTER 666776666	TT 0325E	1 F	FAILED COURSE ISSUED EXAM	05MAR92 EXT	
22	SMITHSTER 000110000	ZZ 1334G	1	DISENROLLED, REACHED ACCD ISSUED COURSE MATERIAL ISSUED EXAM	06MAR89 EXT	
23	SMYTHEMEISTER A 643062166	3420C	123456 PP	DISENROLLED, REACHED ACCD ISSUED COURSE MATERIAL ISSUED EXAM	15MAR89 REEN	

UNIT TOTALS	ENROLLMENTS	COMPLETION	FAILURES	DISENROLLMENTS	RE-ENROLLMENTS		
MONTH	52	23	0	0	0		
YEAR-TO-DATE	73	33	0	0	2		1

APPENDIX C. STUDENT DATA CARD (R-5 CARD)

CHAPTER 3

MONITORING INDIVIDUAL PROGRESS

3000. MONITORING INDIVIDUAL STUDENT PROGRESS

1. A good MCI program must have a two-fold management approach -- management of the individual student's progress and management of the unit's progress as a whole. In this chapter we will discuss individual progress. The first step is to establish and maintain the principle management tool for the individual student -- the "Student Data Card for MCI Course" (R-5 card).

2. When you fill out and detach the R-1 card (Enrollment Application), the R-5 card should be filled out at the same time. Instructions for filling out this card are printed on the form; however, the following detailed instructions are provided for the training officer/NCO. Maintenance of this card is part of the Inspector General's (IG's) training inspection. Be sure to annotate on the R-5 card the date you mailed the enrollment application to MCI.

3001. R-5 CARD ENTRIES (See FIGURE 1)

Student Data Card for MCI Course — **MCI. R5**

Student SSN		Course Title						Date R-1 mailed
Student Name		Course Number		CCD				Date Materials Rcvd (SRB Entry) 1
Lesson/Study Unit PME Course 2 3 4	1	2	3	4	5	6	7	Student Initials for Materials 1
Date Sent								Date Exam to MCI 5
Date Received								Date Alt. Exam to MCI 6
Grade								Date Alt. Exam Failure SRB Entry 6
Resubmitted LSN/SU 2 3 4	1	2	3	4	5	6	7	Certificate of Completion Date Awarded (SRB Entry) 7
Date Sent								6 Month Extension Date 8
Date Received								Disenrollment Date on UAR 9
Grade								Reenrollment Date on UAR 9

Remarks 10

APPENDIX D. STANDARDIZED EXAM SHEET

READ INSTRUCTIONS ON THE REVERSE OF THIS ANSWER SHEET BEFORE BEGINNING TO ANSWER QUESTIONS.

STUDENT SSN | COURSE NO. | EXAM FORM

DIRECTIONS FOR MARKING ANSWERS

- Use No. 2 or softer pencil only for marking.
- Make marks that fill the circle completely.
- Erase completely any answer you wish to change.
- Make no stray marks on this sheet.

REFER TO THE EXAMPLES BEFORE STARTING.

WRONG WRONG RIGHT

	A	B	C	D	E
1	T	F			
2	T	F			
3	T	F			
4	T	F			
5	T	F			
6	T	F			
7	T	F			
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95	T	F			
96	T	F			

MCI-DP37 SCANNABLE LESSON/EXAMINATION ANSWER SHEET showing output format for an individual enrollment. The student's course number, social security number, and lesson number are coded at the top. The student's address is printed in the address block. The course number and course title are printed beneath the address block. The lesson number and the reason why the answer sheet was printed are shown just to the left of the address block. The student's reporting unit code (RUC) is to the right of the address block. The last lesson will be designated by "LAST LESSON" being printed directly under the reason the answer sheet was printed.

FOLD CAREFULLY ON THIS LINE ONLY

Crs: 084 BASIC FORWARD OBSERVATION PROCEDURES

Exam Form: W

CPL ANDERSON BA
MARINE CORPS INSTITUTE

RUC: 54906

Issue Exam
Primary

IF THE DATA CONTAINED IN THE ADDRESS BLOCK ABOVE IS INCORRECT PLEASE PRINT THE CORRECT INFORMATION BELOW

NAME _____ RANK _____ SSN _____

ADDRESS _____ NEW RUC NUMBER _____

EXAM VALIDATION: I certify that this examination has been administered in accordance with the instructions given on the reverse side of this answer sheet. EXAM ADMINISTRATOR NOTE: Exam will be RETURNED UNGRADED if not properly validated.

PRINTED NAME _____ RANK OR TITLE _____

SIGNATURE _____ DATE EXAM GIVEN _____

MCI-DP37

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